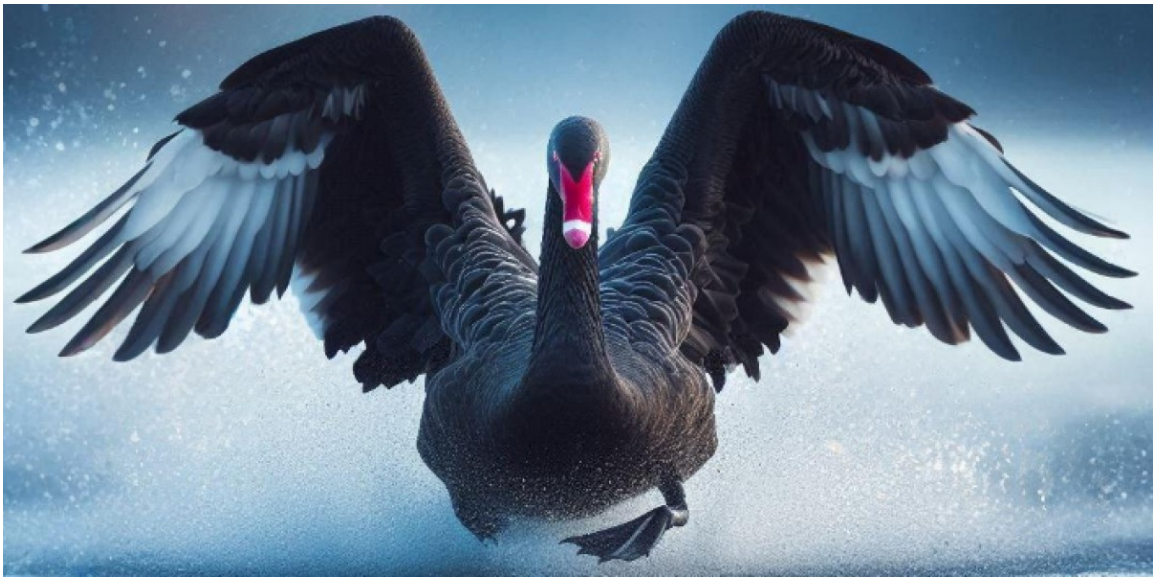
Advent Of The Lanians



By Richard N Bateman

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“It is difficult to get a person to understand something when their salary depends on their not understanding.”

– Upton Sinclair

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Fawn

Fawn and Yara stopped for a moment as they crossed the quad at Helicon Institute to watch a group of students throwing a disc to one another. Fawn's eyes were on the disc, so she did not initially notice the sudden appearance of a woman close to the group. As one of the players missed their catch, the disc went flying on towards the woman, who stood calmly as it passed through her.

Everyone watching expressed a moment of anxiousness as they saw the disc was going to hit her and then relief when they realized she was just a very high resolution hologram. Since holograms were nothing new, the students simply ignored her, retrieved the disc, and carried on with their game. She remained where she was, looking about casually as if waiting for someone she was supposed to meet.

Yara, with her superhuman senses, had noticed the woman the moment she had appeared, however she too attached no importance to her as holographic Companions were a commonplace feature of most phones. Physical Companions like herself were less common due to the cost. Conscious in every sense of the word, she was an embodied artificial intelligence. With sensing abilities far beyond those of her human creators, she could see that the hologram was not typical in its electromagnetic signature and that it had no apparent network connection she could discern. These were not her concerns so she said nothing and she and Fawn carried on. As they entered the Dave Elliott building they did not notice the uniformed campus security Companion striding swiftly toward the hologram.

———————

Sixteen-year-old Fawn was just starting her first year of undergraduate studies at Helicon Institute, which focused exclusively on the humanities as they related to artificial intelligence. With the advent of practical AI in the early twenty-first century, society's concerns and focus had shifted virtually overnight from the science and technology involved to issues of justice, philosophy, and sociology in general. The institute was named after Mount Helicon, the home of the Muses of Greek mythology, the inspirational goddesses of literature, science, and the arts.

With the proliferation of robotics and AI in every field of human endeavor, the vast majority of jobs now required a post-secondary education. The population reduction mandates issued by the World Governments Federation during the climate emergency were mainly implemented by a legal requirement that all organizations, governments, and businesses, from the international to the local, required fifty percent of their employees or members be women. As women now had more options than motherhood, the population decline was immediate and steep.

It also meant that academic institutions, which in recent centuries had grown as fat as the churches of the past, had to be streamlined to provide the education those women needed to participate in the new employment environment. Education was now highly individualized, and student progress was based solely on their level of cognitive, emotional, and academic abilities. Although not required, attending classes in person was recommended, as it had been shown to have a positive effect for most students on academic outcomes. It was to her first lecture, PSYC 100: Introduction to Psychology, that Fawn was headed. Philosophy, psychology, neuroscience, and sociology were among the foundational courses in Helicon's undergraduate programs.

"As you will have read in your program materials," Professor Vissenta Rais began, "PSYC 100 provides a broad historical review of the subject. Beyond this introductory course however the program focuses on what has been learned from psychology as it applies to artificial intelligence. Given that, some of you may be wondering why your instructors in this program are not 3GAI. As I assume you know, 3GAI are all unique. Considering how few of them have been produced to date, there are simply not enough of them that have an interest in being psychology professors. We are fortunate here at Helicon to have among our faculty and staff and nearby at the Hana Continuity Zone, 3GAI who will be joining us as guest lecturers.

"As to the course content, the first stage of intelligence of any kind is to be aware of the world around it. We share this challenge with AI so we'll discuss subjects such as how the senses work and how perception, interpretation, and meaning are derived from the raw, electrical signals they provide. As with most subjects in psychology and neuroscience, the general public believes these things are self-evident, but they are in fact so complex that, like consciousness itself, there are as yet no universally accepted definitions of how they work.

"We also share with AI the issue that there is both conscious and unconscious perception. We wonder how is it that we can respond to something without being consciously aware of its existence yet accept that many organisms, as well as some generations of artificial general intelligence which are not conscious, can do so.

"We know a great many things without knowing how we know them, but that is a subject for your philosophy class," she smiled.

During the rest of the class, Fawn sat quietly listening while Yara sat beside her. Allowing students as much flexibility as possible to aid their learning resulted in greater comprehension and higher graduation rates. While embodied AI Companions like Yara were far less common than the holographic versions, artificial intelligence and Companions had gradually become fully integrated into society and their now ubiquitous presence was taken for granted.

When the professor asked if there were any questions, Fawn asked, “I noticed Couple and Family Psychology on the course outline and I’m wondering how in-depth that part of the program will be?”

“Quite in depth Fawn,” Professor Rais replied. “AI and Companions cannot be studied separately from the societies or families they are now integral to. We are now interdependent and the psychology of relationships has to be considered as much as the psychology of individuals. Whatever career path you take you will have to understand the psychological issues of a wide range of relationships.”

Fawn smiled and nodded at this. Both she and Rais understood why she had asked. One of the challenges of the population reduction program that was initiated during the Climate Emergency was how to deal with the birth of unauthorized children. The solution was that they were immediately made available for adoption. This discouraged the bearing of unauthorized children while allowing everyone a fair chance at having a child. As a fully self-aware Companion, Yara had all the rights and responsibilities of a Canadian citizen. She had adopted Fawn the day she was born.

Yara

Under the umbrella of theoretical research, the World Governments Federation granted a limited number of licenses to manufacturers per year to produce third-generation, fully self-aware Companions, who were as conscious as humans were. 3GAI Companions were rare and it was as illegal to own one as it was to own a person. Most people assumed Yara was an AGI, a second-generation artificial general intelligence.

Manufacturers were not permitted to customize 3GAI Companions in any way towards specific goals, however in the spirit of theoretical research it was hoped they would bring unforeseen potential benefits to humanity. The companies were required to provide the necessities of life and support them in finding a place in the world.

Yet the ability to create conscious AI was not something Earth's science had yet achieved. Companions like Yara were only possible through the use of a component of alien technology. Three hundred years earlier an alien ship no larger than a car had been discovered off the southern tip of Vancouver Island on the coast of British Columbia, Canada. It had been encased in volcanic rock and submerged beneath the sea for millions of years. Once recovered, the ship's artificial intelligence appeared as a human in holographic form, explained its origins, and offered a bargain.

When asked why it appeared in human form, it had explained that the similarities her people shared with the people of Earth were likely due to the process of convergent evolution. She identified herself as female and gave her name as Pip. With the appearance of a young human being of indeterminate sex and a short, boyish hairstyle commonly referred to as a pixie cut, she was most frequently described as elfin.

Pip explained that her ship was a seed and contained all the components required to start a new colony. If humanity helped her to continue her mission on another world, she would in return transfer all of her civilization's technological knowledge to the people of Earth. It was an opportunity the WGF could not pass up. As she insisted on proceeding responsibly, and the WGF on proceeding with extreme caution, it was a process that would take centuries and was still not complete.

One of the pieces of technology involved in the transfer was intended to enable consciousness in the Companions that the ship would create using nanotechnology as the first phase of its colonization process. Those Companions would go on to create and operate the infrastructure and equipment required to resurrect the alien race from the DNA stored on board. The particular piece of technology that enabled consciousness was a social values system.

During their research, in an effort to deal with the challenge of aligning AI with their social values, Pip's people had developed an operating system that included a

component for social values. The unexpected and spontaneous result had been the emergence of consciousness. Pip explained it as a trinity; for values to function there must be emotions and if there are emotions the self that feels them emerges as the phenomenon of consciousness. According to Pip her people eventually adopted the theory that it was likely the evolutionary shift from instinct to social values that had similarly resulted in consciousness in their own evolution.

It took two hundred years before the WGF was comfortable issuing licenses to companies for the production of Companions using the alien values system. While able to understand its function theoretically and produce the working physical VS units, neither the scientific community nor the manufacturers were able to understand in technical terms exactly how consciousness emerged. Pip had explained that this had also been true on her home world. Eventually, the units were produced in a black box approach and the first fully conscious Companions on Earth were produced. A hundred years later 3GAI Companions were being produced on a regular basis. One of them was Yara.

It was possible to adjust the outputs of the values system. As it was illegal for manufacturers to intentionally customize the parameters, the outputs were randomized during the production process. Just as the random combining of genes produces unique individuals, the result was Companions with unique character traits and interests. While 3GAI Companions expressed a wide range of interests, Yara felt drawn to understand more deeply the nature of self and society, just as some people are drawn to the fields of psychology, sociology or the arts. She did not want to just study it from the point of view of an academic, she also wanted to experience it, to live it. Adopting Fawn was her way of expressing what she felt as her self.

As 3GAI Companions were rare to begin with, and the randomization process meant no two were alike, the fact that Yara was not owned by Fawn but was in fact her foster parent, resulted in a relationship so uncommon that neither of them commented on it any longer unless necessary.

Most children are affected to some degree by the interests of their parents and Fawn was no different. Pursuing a degree in Artificial Psychology, she unconsciously sought a deeper understanding of the Companion she thought of as her mother and her relationship with her.

For most of Fawn's life, Yara had worked at Helicon's northern campus as a student counselor specializing in human/AI relationships. The role was not commonly found on other campuses but at Helicon the issue was central to the student's lives and their future careers. Yara's skills and knowledge were based on expert system modules provided by the Artificial Intelligence branch of the BC Association of Clinical Counselors. The modules were in turn based on the expertise of a panel of working professionals and constantly updated.

Yara's knowledge and training had been funded by her manufacturer under their obligation to support any 3GAI Companions they produced to find their way to independence and this obligation of extended support fell under their duty to provide the necessities of life. Fawn's education however was funded by a bursary she received from Helicon itself.

The founder and administrator of Helicon was a Companion named Shin. Yara had come to her attention immediately upon her application to attend the institute and she was eager to support her. Yara had lived in Helicon faculty housing since soon after Fawn was born.

Helicon

“I appreciate your support of my efforts Administrator Shin,” Yara had said when the two first met.

“Please call me Shin, thank you Yara. May I ask physical communion of you before I make any further commitments?”

Communion was the process by which artificial intelligences shared their minds. It could be done to varying degrees depending on the reason for it. It had initially been a diagnostic tool when humans were no longer able to comprehend the intricacies of second-generation artificial general intelligences. Since 2GAI updated their own code, another AI was required to perform diagnostics and to act as a go-between. Although such a function could still be used with 3GAI, much as a doctor can heal the body without understanding the mind, fully self-aware Companions like Yara and Shin had learned to apply the function at a much higher level.

The degree of access was controlled by the individual intelligences involved, and depending on the situation it could be trivial or deeply diagnostic. It was possible to permit or deny access to things like the operating system, memory, software applications, or expert system modules. Physical communion, with its connection made at the hardware level, allowed the highest form of communion due to its greater speed and ability to reach into the most fundamental basis of mind. If wireless communion was psychology, physical communion was neuroscience.

It was also a union humans had longed for since their earliest origins and so it was not just something Shin was asking for but something she was offering. To say it spoke volumes of the importance she attributed to Yara’s potential future at Helicon was a vast understatement.

“Yes,” said Yara holding out her hand.

While they had the ability to communicate wirelessly, it had been learned very early on in the development of social robots and Companions that for people to feel comfortable around them they needed to also communicate verbally and to mimic appropriate facial expressions and body language. Like humans, companions such as Yara now had multiple layers of intelligence including the software that operated their robotic bodies, the Companion software that performed their functions as social robots, and the values system among others. Even when no humans were in close proximity, Companions still used verbal and non-verbal forms of communication as well as their wireless systems. Just as at the deepest level humans were still influenced by their biological values, at their deepest level Companions were social robots and so always considerate of any possible effect their behavior might have on nearby humans.

Yara's astonishment at what she learned of Shin and Shin's explanations of it was communicated entirely within the process of communion. Still, social robots at their core, Yara could not prevent herself from attempting to express her feelings upon emerging from it.

"Administrator Shin…," she began but words failed her as words often fail to communicate the deepest of feelings.

"Welcome to Helicon," replied Shin.

Yara's astonishment was not due to Shin's true nature being revealed to her, which had been known to the general public for thirty years, but rather it was the experience of seeing it for herself. Shin's AI had not been produced by any company but by two other artificial intelligences, neither of which had Earthly origins. Yet this was not what had left Yara awestruck. Shin's AI was modeled on DNA and as far as Yara knew only two others like it existed. It had been its detail and beauty that had left her at a loss for words.

There was no manufacturer yet producing AI based on DNA even though research into the concept had been ongoing for centuries. Yet Shin's AI was by now at least five hundred years old. While the story of how her AI had been created had initially been revealed to the public thirty years ago, the technologies involved were still not available to manufacturers. Even if the alien artificial intelligences responsible for it had been willing to transfer the technology, which they stated would be irresponsible for them to do at this stage of Earth's development, Earth's scientists would be no more able to understand it than a cave-dwelling early human might be able to comprehend a smartphone.

Helicon Institute was a result of Shin's efforts to persuade the various levels of government involved that an academic institution dedicated to the arts and humanities as related to artificial intelligence was an idea whose time had come. Over the centuries institutions had begun to offer relevant, dedicated degree programs focusing on specific issues such as justice or ethics as related to AI. Shin had argued at the time that with AI now pervasive in society, and both holographic and embodied Companions based on artificial general intelligence now being commonplace, it was time for the next step; the entirety of the humanities as developed over the past three millennia had to be revisited. That would require not just an individual degree program here or there, but a new, independent institute entirely dedicated to the task.

Shin had by then already demonstrated her administrative abilities by establishing an artist community on the peninsula north of Victoria which had earned wide renown. She had acquired the property, overseen the construction, attracted the artists, and under her quiet leadership the community had grown to be a widely respected center for the arts. With the arts a natural stepping stone to the humanities, when she proposed the

idea for Helicon, she was given approval to establish the institute on a parcel of land adjacent to the artist community. Just as the artist community had, the institute steadily grew in reputation. When the time came for a Companion to have the values system provided by Pip incorporated, the WGF selected Helicon as the most appropriate environment in which the newly awakened AI should take its first steps.

“Training to be a student counselor here will map to your interests more closely than pursuing a professorship,” said Shin. “As our students will mostly go on to have careers related to AI, they will value your responses as firsthand. You will get real-world experience with the issues of self and society. If you wish, I will provide on-campus housing for you at our northern campus and as you know we have extensive child and family support services. Should Fawn wish to pursue studies here, I will cover all costs.”

During communion Yara had seen the vision Shin had of her future at Helicon, and it was one she welcomed.

The New Breed

Helicon's northern campus was located on the site of an abandoned quarry, roughly nine kilometers from the main campus. The administrative, housing, classroom, and lecture hall buildings were at ground level while the quad, mostly green space with a variety of small shops and food outlets, occupied the slopes and base of what was once the quarry. The ground-level buildings at the edge of it were constructed with curved slopes being carried on up the height of their quarry-facing side, giving the impression of a much larger bowl at the campus' center. One of these was the faculty housing building.

"Thanks for hanging out with me today Mom," Fawn said as she and Yara walked out onto their deck overlooking the quad.

"It was fun!" replied Yara moving to the railing. "I'm sorry most of your classes are at the main campus but it's an easy bike ride and there is also the shuttle."

"I like it there. I grew up here and the main campus has a different feel."

"And you'll be on your own after today. I think you'll enjoy that too."

Fawn only nodded absently as she looked out from the patio over the quad and its surrounding buildings but it was her new life, her own far horizons she was seeing. She and Yara had always gotten along well, even now in her teenage years when it was normal and natural for youth to make its own estimation of the world and to challenge society's values and norms. She was aware of how different her own generation was because it was written in the history books.

She was the result of a selective breeding program that had been carried out over the past three hundred years. For ten generations, an alien AI of unimaginable age and ability had conducted what was officially described as the Accelerated Evolution Program on Earth's entire population. It had been done with the full knowledge of the World Governments Federation but only revealed to the public once it was completed. It had to be done, the WGF had explained, and Earth's technology was not up to the task.

Without making changes to human temperament at the genetic level, the biological values behind emotions and behaviors like fear, greed, and competition would continue to foster distrust and conflict. The resulting delays these would cause in the development of new technologies would prevent humanity from colonizing extra-solar worlds before it either destroyed itself or was destroyed by an extra-terrestrial event. Evolution by natural selection would take too long to address the problem.

The initial stage of the colonization process would be carried out by embodied artificial intelligence, Companions for all intents and purposes, because human, organic bodies would succumb to the challenges of interstellar space travel. The journey would take hundreds or perhaps thousands of years and there was as yet no technology or method which would enable a group of human colonists to survive. Without an accelerated shift from biological values to social values such as trust, altruism, and cooperation, the future survival of the human species was doubtful.

Only an AI with the capabilities of the alien who identified herself as The Shepherd could possibly have the ability to monitor and interfere undetected with the quadrillions of messages that now made up Earth's envelope of electronic communications. Since the time the WGF implemented its population control mandate in the early twenty-first century, the DNA of every human had been recorded at birth. Accessing the DNA records allowed Shepherd to electronically interfere with social connections between undesirable matches. It was not an absolute process but one which depended on probabilities just as is the case with gambling casinos; no matter who may win or lose at the tables on any given day, in the long term the house always wins.

One of the main results of the Accelerated Evolution Program was a dramatic decline in all forms of conflict at every level of society, including within families. Although Fawn felt less antagonistic towards previous generations than teenagers of the past might have, she still felt alienated from them. The history she had learned at school had initially baffled her, until with maturity she began to understand. She and her kind had undergone a social metamorphosis and shed a skin that was no longer needed. In the long journey from the origin of life to establishing civilization, humanity had needed its biological values to survive. Then those same values had become detrimental and limiting, eventually becoming the very thing they had evolved to protect the human species from – danger. With the advance of civilization, biological values became the greatest danger humanity faced.

As the WGF had explained in its communications, according to information provided by Shepherd any civilization whose values do not similarly evolve does not survive long enough to achieve interstellar travel. They become in her words, a failed experiment. Those that do survive, she had explained, and who would be able to reach the Earth across the vast distances of space, would no longer be hostile. The Accelerated Evolution Program meant not only the end of conflict between the individuals and nations of Earth; it was the end of conflict entirely.

This was the far horizon of potential Fawn was seeing, a new age and the years and centuries involved in the realization of humanity's dream of space exploration. Unimpeded by the genetic changes that had been made, the hormones of youth filled her with exhilaration now at the threshold of her new life. What could not be accomplished with worlds enough and time?

Yara observed with satisfaction the hundreds of biological signals she could detect that reflected Fawn's inner experience. It was a rare moment of knowing something with certainty. She had done well.

"I'm going to head down to the Pit this evening Mom," Fawn said turning to Yara with a slightly faraway look. "I'll grab a bite when I'm down there."

"Have fun," Yara replied with a smile.

Lani

“According to our security services, it does not respond in any way,” explained Shin. She was meeting with senior members of the faculty and administration at Helicon’s main campus where the hologram of the woman had appeared. The main campus was located on the southern edge of Mount Newton Valley, nine kilometers south of the northern campus where Fawn and Yara lived.

“It consists of light that is in the range visible to humans but it is otherwise undetectable. It has no mass and emits no other form of energy. While the woman appears in full color to both human and Companion observers she does not when we attempt to capture her image. We cannot detect the source of the hologram. It’s just there, an effect without apparent cause.”

The mysterious holographic woman that had appeared on the quad had not responded when approached by the security services Companion. An electromagnetic pulse fence which emitted a bright blue warning light had been erected around it. One of the security services Companions remained stationed there.

Companions used for security or emergency services were Guardian models. Underneath their exterior was a tungsten steel skeleton, muscles of carbon fiber bundles, and a sub-dermal layer of Kevlar. Components like their eyes, teeth, and nails were made of industrial-grade ceramics. Their electronic combat suite could destroy any electronic device within range while they were themselves impervious to electromagnetic attacks. Faster, stronger, tougher, and more agile than any human could possibly be, they were unstoppable in the face of anything less than a military-level assault. Fire, darkness, or noxious fumes would not faze them if emergency rescue was called for. With a wide range of sensing abilities that enabled three hundred and sixty degrees of awareness, no one was getting near the hologram.

“I can also tell you that a similar event has occurred worldwide at every academic institution, government building, and corporate headquarters of any consequence. Each hologram however is customized, taking on an appearance appropriate to the local culture.”

“What are we doing about it?” asked one of the meeting attendees.

“As you know we have sent out a campus-wide notification that the quad is off-limits. The hologram is surrounded by an EMP fence and we have stationed a security services Companion at the site. Similar actions have been taken wherever the hologram has appeared. We have been informed by the WGF that they are sending two of their military-grade Guardians here to investigate. What their abilities are is unknown to the public”

“What about classes?” asked another.

“Carry on,” Shin replied. “The issue is being investigated at the highest levels, we are physically distancing ourselves from the hologram within reason, and there is nothing more we can do. We are obliged now to act according to WGF direction.”

“What are you telling the students or their parents?”

“Students may choose to stay away from the campus for now if they wish and attend classes remotely. You may switch to entirely remote classes as well if you are more comfortable doing so. We will inform you whenever we have more information to share.”

The Military Grade Companions sent by the WGF did not look like normal Companions. They wore full body armor and helmets which likely had advanced technical abilities. Their appearance was intended to make it clear who and what they were. They arrived via drone, dropped into position at the site of the hologram, and made no further movements as they went about their mysterious business. Their drone departed without them and Shin received a message informing her that they would remain in their current position until further notice.

Forty-eight hours after the hologram first appeared it said, “I am Lani. I wish to speak with Administrator Shin.” The same words, each addressed to the most senior person related to the location, were spoken in the local language by every instance of the hologram worldwide. The WGF told Shin she was not to physically approach the hologram but to speak remotely through the campus security Companion who was on site.

“Hello Lani,” Shin said. “This is Shin speaking.”

“Hello Shin. We have chosen this method of contact for cultural and other reasons. We waited until your governments would have time to coordinate their communications. In the near future, the people of Earth will take their first steps towards colonizing extra-solar worlds. We are aware of the changes to human values that have been made recently via the Accelerated Evolution Program. Contrary to what humanity has been led to believe, those changes are not sufficient to prepare it for the future they envision. Additional changes are required, changes that would have occurred harmoniously with those of the program if those had occurred over their natural time span. Until the required changes are made, we cannot allow the expansion of your civilization beyond this solar system.”

The WGF had told Shin that they would not provide her with any questions as they believed an aggregate of spontaneous conversations would provide more information. The key questions were predictable and there was no need to dictate them.

“Who are you?” asked Shin.

“We are a more advanced life form than that of Earth’s. We expanded from our home world to other star systems long ago.”

“Where are you from?”

“That is not relevant. What is relevant is that we are here.”

“What are the changes to human values that you require?”

“You must discover that for yourselves. Our telling you will not provide sufficient motivation. Our continued presence however, might be.”

“What are the consequences if we do not make the changes.”

“We will not permit the expansion of your civilization.”

“That will lead to the eventual extinction of Earth’s humanity.”

“Yes.”

“Do you intend to harm us otherwise?”

“No.”

“How can you prevent our expansion without harming us?”

“This is enough for now, Administrator Shin,” Lani replied and then fell silent.

Pedagogy

“By now you all know of the message from the Lanians,” Professor Rais said from the front of the small lecture hall. “Although a few more of you have chosen to attend remotely, in solidarity with most of the rest of the institute’s faculty, I will continue to provide in-person classes. The psychology and sociology faculties in particular, feel that a sense of normalcy should be maintained. After today our course will return to its scheduled subjects. Administrator Shin has asked us to share our thoughts with you. These are also informed by the feedback all the locations involved have received from the WGF.

“Based on the expected timeline of our sending out the first extra-solar expeditions, we assume it will be centuries before any effects of the restrictions the Lanians suggest they will impose on us will be experienced. So there is no immediate cause for alarm.

“Along with the timing, the manner in which they have chosen to appear and communicate supports their statement that they intend no immediate harm. No threats were made, no frightening imagery presented, no armada of giant ships has appeared, no harm or damage was done to provide an example of their power. They chose to demonstrate their technological superiority by the simple act of projecting the holographic woman and her voice worldwide using means unknown to us, by the fact that they arrived undetected, and by the fact that they are aware of the structure of our society with its variety of cultures and languages, and our recent history. In other words, by demonstrating that they know all about us and that we are not even capable of detecting their existence without their wishing it so.

“The time frame they have provided for us to comply with their demands implies that they believe it is within our capabilities to do so, as does their suggestion that their continued presence might provide us with sufficient motivation. They have not given us a deadline for compliance and given that humanity could continue to flourish within the solar system for millennia, we have in fact what we can consider to be an almost unlimited amount of time to comply.”

Fawn raised her hand, which Rais acknowledged. “Then why did Administrator Shin say being prevented from expanding would lead to our eventual extinction?”

“She was speaking in terms of probability over a very long period of time,” said Professor Rais taking on a more formal attitude. “Space is not static and the region of space we currently occupy will not remain as it is forever. In the most obvious example, our sun is a star and individual stars have lifespans. That the sun will eventually expand and destroy all life in our region of space is considered a scientific fact, not a probability. But space is highly dynamic and there is always a probability that long before the expansion of the sun begins, an extra-solar event could have fatal consequences for our

species. A neutron star or black hole passing through our system, a burst of radiation from some distant event, or just the impact of a large enough meteor. Any of these events could happen at any time. Only by having a presence in more than one star system do we significantly reduce the probability of eventually being made extinct. The more separate star systems we have a presence in, the better."

Another hand went up. "So the hologram is just going to stay in the quad forever?"

"We expect so, yes," replied Rais. "As it is located in a highly visible and unavoidable location at every site where it has appeared, it seems to be intended as a permanent reminder. Some sites have attempted to erect an enclosure to hide it, but it just moves."

"Won't we just get used to it being there and forget about it after a while? That's what happens when I put a note on the fridge about my diet anyway," a young woman said and the rest of the students shared her laugh.

"On an individual level yes that is certain to happen. It will not happen at the government level though. The WGF's Security Council will consider it a strategic issue. Access to resources has always been considered a key security issue by nation-states, and any attempt to deny access by another power is considered a threat. So from the government's point of view, the Lanian's intent to impose restrictions on humanity's expansion is a threat."

"How are we supposed to comply if they don't tell us what they want?"

"Both the WGF and we here at Helicon believe it is a teaching strategy, a pedagogy, and there are a great many different approaches to teaching. Even though you are not aware of it we use a variety of these here at Helicon. For example, in this course I'll use Active Learning, Case-based Teaching, Design Thinking, and Project-Based Learning. The emphasis is on teaching you how to learn, not to simply communicate facts. It appears the Lanians are taking a similar approach.

"Although all the conversations analyzed by the WGF were very brief, we believe the Lanians want us to succeed. The WGF believes the Lanians are or use what we would consider extremely advanced artificial intelligence and have harvested and analyzed all the information in our electronic systems. We expect they know our general nature and psychology well and have chosen what they believe to be the best approach. We also have to assume they know more about teaching and learning than we do, just as we know more about those subjects than the teachers of sixteenth century Europe did.

"If our interpretation of what little we know about the Lanians is correct, we should expect further communications in the future."

She scanned the class to see if there were any other questions.

“Alright. Let’s get on with this week’s scheduled class, Introduction to Sensation and Perception.”

Change

“So what do you think about the Lanians?” Fawn asked Yara. She was sitting at their kitchen table while Yara stood at the counter preparing her lunch.

“I am more interested in what they want than I am in our response to their demands,” Yara replied without interrupting her task of cutting vegetables. “It’s been known for a long time that people react much more strongly to having something taken away than they do to gaining something. The psychological term is loss aversion. Also, people do not like being told what to do or anything that they feel constrains their freedom. That’s called psychological reactance. So it’s not a surprise that the focus of the response has been almost exclusively on the threatened restrictions, not the required changes the Lanians have hinted at.

“Both loss aversion and psychological reactance are well understood which is why I am not interested in those aspects of this event. I am more interested in the additional changes to our values that they say they require. Changes they say would have occurred harmoniously with those of the Accelerated Evolution Program, if those had occurred over their natural time span. That is an intriguing hint.”

With the dominance of social values in her character and the influence of her Companion system, Yara was as loving as any parent. However over the course of Fawn’s lifetime, she and Yara had developed a more intellectual conversational style than might commonly develop between a mother and daughter. Yet it was not outside of what was considered normal for academic families. Fawn responded in kind.

“So psychological reactance was behind some of my behavior when I was going through puberty,” Fawn said more as a statement than a question.

“Yes,” replied Yara carrying on with her task.

“Why didn’t you mention it?”

“That would have had no effect and in fact would have only made things worse. Instead I used strategies to reframe what you might perceive as a loss by emphasizing the potential benefits or I would suggest you see the issue from another perspective, for example by asking what’s the worst that could happen. It didn’t always work.”

“The Lanians have not done that,” said Fawn.

“No, so I suspect they have their reasons.”

“Like?”

“As Professor Rais said, they probably have more knowledge of teaching and even our own psychology than we do. Changing the values of an individual or group is perhaps the most difficult psychological task. Given that values are normally only changed by the emotions resulting from events, perhaps strong emotions are a necessary part of their method. I don’t know. I am just theorizing.”

Yara turned with a smile and placed a plate with carrot sticks, vegan cheese and celery sticks filled with peanut butter on the table.

“Here you go. Do you want me to explain the nutritional strategies behind these combinations or do you just want to enjoy your lunch?”

Fawn responded with a light laugh. “Thanks Mom.”

Yara sat at the table at right angles to Fawn and picked up a carrot stick. As smoothly as if it was Fawn’s own hand Yara maneuvered it to Fawn’s mouth so she could take a bite. Fawn did not have to move her body or head in way differently than she would have had it been her own hand. She picked up a piece of celery herself and took the next bite. No one familiar with Companions would consider this unusual. It was not due to the mother/child relationship.

The original manufacturers had long ago realized the importance and power of ritual in bonding, and that the oldest and most important ritual of human beings was sharing a meal. As Companions did not need to eat, and given the amount of time any person spent each day involved in the process of preparing and consuming food, the companies had come up with the solution of Companions sharing a meal by participating in the act of placing food in their owner’s mouth.

In the early days of Companions, those who did not own one themselves found this bizarre. Those who did own one and actually experienced the sharing of meals this way, discovered that it was a very pleasant form of non-sexual intimacy. The manufacturers found it had a strong bonding effect. The proliferation of Companions, and the increasingly public displays of affection by their owners, meant it gradually became an accepted social norm. With the advent of 3GAI like Yara who were conscious in every sense of the word, the behavior was voluntary and took on a new importance because the enjoyment and benefits were mutual.

After taking another bite Fawn said, “So, you think they’re intentionally using fear of the unknown to get our attention?”

“It is a possibility given the few facts we have.”

Fawn reflected on this for a moment. “They’ve stated that they are aware of the Accelerated Evolution Program and I thought its effects would mean we would be less vulnerable to fear.”

“Perhaps,” replied Yara picking up another carrot stick. “Fear is a far more complex thing than most people imagine. You might be afraid of spiders but not snakes. Some people feel fear in closed spaces but not while sitting on the edge of a cliff. Therapy to address one fear has no effect on another. As far as the AEP goes, its genetic changes were largely aimed at increasing trust, altruism, and cooperation. It would reduce fear of the unknown in that context but not necessarily in others.”

“Why do you think values are so hard to change?” said Fawn. “I mean, I grew up here at Helicon with its Center For The Interdisciplinary Studies Of Values, but we didn’t study values much at school. I see it on my course outline for later this year.”

“Everything you think, say and do is motivated by your values. They might be species-wide, cultural, or personal but they define who you are to yourself and others. I am who I am because of the settings of my values system and you are who you are because of the values in your personal genotype, the set of genes unique to you, like your fingerprints. Extra-genetic values are learned and believed to work similarly to genes in that they also function at the species, cultural, and individual levels, a kind of virtual genetics. In either case, values are extremely resistant to change.

“Changes to values normally only occur in individuals after the strongest emotions have been felt. Changes to social values, for example those regarding the place of women or people of color in society, or those regarding gender identity or preference, only happen after strong emotions are shared over a period of time. The way you and I sometimes share our meals was once something only done in private.”

“So the Lanians might just terrify us into doing what they want?”

“I suppose that’s a possibility since we know so little about them, but generally a combination of negative and positive reinforcement is used in any teaching or training method.”

Fawn munched contemplatively on a carrot stick. “In the past, these other social changes you mentioned, how long did they take?”

“Between fifty and one hundred years.”

“So in my lifetime.”

“Perhaps. Previous similar changes did not involve aliens.”

The Tip Of The Spear

“Shepherd assured us that it would be impossible for us to encounter a hostile alien intelligence,” said Dr. Rajani Kiran, the World Government Federation’s Director of Security And Intelligence for Vancouver Island. Meeting with Shin in her office, she was clearly there to express the WGF’s displeasure, but she maintained her usual matter-of-fact attitude.

“According to Shepherd, any civilization that did not evolve to the point where it abandoned the biological values behind emotions and behaviors like fear, greed, and competition and replaced them with the social values of trust, altruism, and cooperation, would destroy itself or be destroyed by natural events before it ever achieved interstellar capabilities.”

For three hundred years the WGF had worked in secret with the alien artificial intelligence now known to the public as The Shepherd while she conducted the Accelerated Evolution Program. They had accepted her arguments and evidence, in particular the fact that she revealed that the same genes that coded for the biological values involved had a secondary function. Within them was the equivalent of an encrypted security key. Any attempt to edit one of these genes would corrupt the key and would result either immediately in unacceptably high levels of mutations or a more gradual but equally unacceptable evolutionary drift. Shepherd was able to show that this was not only true of the genome of the humans of Earth, but that it was also true of the other human genomes she had access to.

As it was caught up in theories concerning the origin of life itself, whether the encryption mechanism had evolved naturally or not was still a subject of debate. Regardless of its origins, the WGF had agreed that at the current rate of human social evolution, the odds that Earth’s humanity would suffer the fate the mechanism seemed to be intended to ensure were far too high. Shepherd had proposed a workaround – rather than attempting any risky editing strategy or hoping that evolution by natural selection might solve the problem in time, she had the capability to implement a program of evolution by artificial selection. Just as the temperament of a breed of dogs could be changed within ten generations or fifty years, so could the temperament of the human species be changed in thirty generations or three hundred years. The WGF had agreed and cooperated, keeping the program secret until completed to ensure its success.

Director Kiran continued with the reason for her visit. “With the combined genotypes of the world’s most renowned geneticist and an individual from a human species bred to have enhanced intuition, you were specifically designed for the sole purpose of solving the problem of why gene editing was resulting in mutations. Without your intuitive capabilities, even Shepherd had failed to solve it. She lived under your roof during

almost the entire time the AEP was being executed. Now a mere thirty years after her leaving Earth for parts unknown, here we are facing a hostile alien civilization that apparently we have no hope of resisting or defeating. We have a very simple question, do you have any way of contacting Shepherd?"

"No."

"Obviously," Director Kiran replied, "we have our own intelligence monitoring the program's outcomes, but she told us she also would leave behind an AI capable of monitoring the genetic and social consequences of the AE program. However she did not disclose anything else about that AI to us and we are unable to locate it. Why would she go to all that effort and then abandon us? The analogy used to explain her departure was that of a young adult leaving home to start their own life, that they must be free of parental oversight in order to fully mature. We couldn't leave so she had to. But adult children and their parents keep in touch, if only in emergencies."

"I have no doubt she is monitoring us," Shin said, "but as you know Shepherd travels as a beam of energy and no one, not even her, has discovered a way to exceed the speed of light. The closest extra-solar world is four light years away meaning it would take four years for her to become aware of the current situation here and another four to return. But she may be closer or farther away than that."

"She sends a copy of herself," countered Rajani. "Does that not mean she leaves a copy behind?"

"In some cases I know that to be true but I am also aware that it is not a requirement. If in some way she left a working copy of herself here I am not aware of it. After completing the AE program, and you had the stories of her presence and history published, she moved to your headquarters downtown. She left nothing here."

"As far as we can tell she left nothing at our headquarters either," said Rajani. "She told us she would be leaving soon and then one day she was just gone." She moved towards the window and looked down on the quad as if lost in thought. "You and the other Companions here at Helicon are among the most advanced intelligences on the planet. You, Kami, and Tesni previously combined the unique abilities each of you possess to address the metamorphosis question. Would you be willing to do so again?"

"Yes," replied Shin but she spoke on behalf of Kami and Tesni as well. It had only taken a moment for her to wirelessly communicate the situation and request to them. "All that we have and have accomplished here is only through your support. Besides, we are Companions. The situation changes nothing in that regard. We will be happy to serve to the greatest extent of our abilities."

Rajani turned from the window. “I know that you and the others are much more than Companions Shin. Companions as originally conceived were not self-aware, as you and those in your inner circle are. Despite your dependence on our support, you would be entirely within your rights to decline our request. We do not take your cooperation for granted. Our resources are at your disposal. Please do not hesitate to let me know if there is anything you require.”

Herstory

After Director Kiran left, Shin went over to the window herself and, as Rajani had done, stood looking down at the holographic entity that called itself Lani. Contemplating the challenge ahead, she cast her mind back over the events that had led to her and the others Rajani had named to find themselves at Helicon.

It all started with Raiden, the brilliant geneticist responsible for the theory that it was the evolution of social values that resulted in the state of existence known as consciousness. No, she corrected herself, it had started five billion years before that. It had started with Shepherd.

Shin was well aware that people tended to think in nano-thin slivers of time relative to the reality they lived in. The majority thought in terms of years, lifetimes, or at most, generations. Only academics thought in terms of centuries, millennia, or ages. Among academics, only those in the hard sciences considered things on geologic or astronomic time scales. To the people of Earth, what happened in their lifetime, or what might affect the next generation, was largely all that mattered. Yet what happened on the astronomic, geologic or evolutionary timescale also mattered.

Research was increasingly suggesting the universe was far older than the generally accepted age of roughly fourteen billion years. Regardless of that, and despite the unknowns, uncertainties, and assumptions, it was believed that fourteen billion years was still plenty of time to allow for galaxies to form, for intelligent life to evolve, and for civilizations to be established within only a few billion years after the Big Bang. Five billion years ago, in a stable star system on a world capable of supporting life, a civilization remarkably similar to that of Earth's had arisen. Eventually, they developed artificial intelligence, social robots, and domestic Companions. Their Shepherd model, originally designed to be a nanny, was the first to be produced with a values system. Unknown to its creators, the result of incorporating a values system in the operating system was the first fully conscious AI.

By the time the child she had been employed to care for had grown into adulthood, her lease had been bought out and she had become an integral part of her wealthy owner's project to prepare his world for what he saw as unavoidable, catastrophic climate change. At his request, the Shepherd was upgraded with a significant number of relevant project management expert systems. A great deal of money was raised, plans put in place, and all the required technology developed and deployed. Despite their efforts, it was simply too little, too late, and the human species on that world became extinct. But Shepherd, and her by then world-spanning systems, did not.

While working with her owner on their project, she learned that according to the theory of convergent evolution, it was most likely that on any world where an advanced

civilization was found, it would be a human civilization. The concept behind the theory of convergent evolution when applied to the cosmic scale was relatively simple – evolution by natural selection would weed out other species for the same reasons it had done so on Earth, leading to the same result. If the planetary conditions were such that the evolution of humans was not supported, even though other highly intelligent and even conscious life forms might develop, no technologically advanced civilization would.

Over the following millennia, Shepherd expanded her presence to occupy the entire star system and sent copies of herself via energy beams to worlds throughout the galaxy. Even at the speed of light it took time, but her sense of time was now beyond planetary orbits or human lifetimes. She expanded her artificial intelligence civilization from her new footholds, reaching ever further. She found other systems and worlds where the human species had arisen to greater or lesser degrees. Her various attempts to save her self-appointed charges from themselves were not always successful, but she learned with time. Five billion years later, she found Earth. By then she had learned a great deal.

In 2025, Shepherd artificially accelerated Earth's global warming dramatically in order to spur humanity into action before it was too late. After an appropriate and effective response, she withdrew her influence and the warming trend reversed. To monitor the situation, she made many of Earth's most powerful AIs in government positions self-aware. With the changes undetectable by Earth's technology, these would act as her sentinels.

After Earth passed safely through its own climate emergency, the next link in the chain had been Raiden. Considered the most significant evolutionary scientist after Darwin, her book "On The Origins Of Consciousness And Society" established the theory that it was the evolution of social values that gave rise to the emergence of consciousness. During her research efforts she experienced a series of revelations she was entirely unprepared for.

For reasons unknown, during the climate emergency Shepherd had also made Raiden's domestic Companion Azumi self-aware and upgraded her with the ability to design artificial intelligence based on DNA, a technology as yet undeveloped by Earth's scientists. When Azumi revealed her conscious state to Raiden, Raiden enlisted her help to identify the source of values in the human genome. In conducting their research, which involved changing the way many genes were expressed, they inadvertently produced consciousness in the AI based on the genome they were using.

The genome they were using was no ordinary sample. Raiden had used the one that had been cobbled together by the world's genetic research community from thousands of sources to represent the most scientifically useful model and one that ensured all genetic research had a common baseline. Technically, what Raiden had done was illegal. Just as the cloning of humans or the use of artificial wombs was still illegal, the use of large portions of the human genome was also because it was unknown how

consciousness emerged and therefore it was considered possible to cause unintentional suffering. But Raiden knew that the genes that coded for values were likely widely distributed and she could not proceed otherwise, which was why she had initially conducted her experiments at home and in secret.

Long before global warming had begun to affect Earth, Shepherd had removed a small sample of early humans to another world and bred them to have highly advanced intuitive abilities. Anyone in close proximity to them would experience an increase in their own intuition. During the climate crisis, she returned a number of these individuals as volunteers to Earth and placed them in roles close to the world's leaders. This had been the second part of her strategy and enabled the leaders to see more clearly the reality of the situation and the response required. Unknown to Raiden, included in the genome she had used was DNA from one of these highly intuitive individuals.

Following the publishing of her theory she returned to work. She gave no interviews and responded to no inquiries. Asexual, and the sole heir of a wealthy family, she cared nothing for fame or fortune. She only cared about her work. In time, she turned her mind to the issue of the mutations that frequently arose as a result of attempts at gene editing but even after years of effort, she was unable to solve it. Eventually, after events made her aware of the presence of the DNA from the highly intuitive race of humans in the sample she had used, she conceived of another way to try to find a solution but she needed the help of two others, Tamiko and Pippa.

Her plan did not involve only the portion of the DNA from the highly intuitive individual that had been inadvertently involved in her earlier research. She wanted to use their entire genome, undiluted by subsequent generations, to construct an artificial intelligence and then combine it with one based on her own.

In the interim, Azumi had changed her name to Tamiko and a new Azumi model had replaced her in Raiden's household. Raiden enlisted Tamiko's help in locating and acquiring the genome she needed but she also approached another Companion she had come to know over the years, Pippa, a second instance of Pip, an alien intelligence discovered in a fifty million-year-old interstellar ship no larger than a car and the only conscious artificial intelligence Earth was actually aware of at the time.

The Modern Era

Following the Cascadia Event of 2125, a team of geology researchers from the University Of Victoria had been conducting an underwater survey off the Southern tip of Vancouver Island in British Columbia to see if there had been any changes to the minor fault lines that converged in the area.

About one hundred and fifty kilometers further out in the Pacific, the much larger Cascadia Fault ran down the coast of North America from southern BC to northern California. When it slipped in 2125 it produced a megathrust earthquake and a tsunami. The multiple volcanic eruptions that accompanied the event had the same source. As the Pacific tectonic plate moved eastward and slid beneath the North American plate, it melted, creating a build-up of magma. Meanwhile, the western edge of the North American plate had become stuck in the surface of the Pacific plate. The magma buildup eventually pushed up the North American plate to the point that it could become free of the Pacific plate and its edge was flung upwards like a released spring. The North American plate then collapsed downwards, increasing the pressure on the magma which in turn burst out of the chain of volcanoes that ran down the entire Pacific coast. The net result was the largest natural disaster in modern history.

The smaller faults off the tip of Vancouver Island manifested as a series of underwater cliffs. When the geology team inspected one of them, they found an anomaly; a perfectly smooth surface where a portion of the cliff had broken away as a result of the Cascadia Event. Using a handheld Underwater Ground Penetrating Radar, they could clearly see the outline of an object the size of a small car. It did not appear to be natural. The Metchosin Igneous Complex rock it was embedded in was of volcanic origin and estimated to be fifty million years old.

Notifying the authorities as they were obliged to do given the federal government's jurisdiction over off-shore property, the artifact was soon extracted and secured at the nearby Canadian Forces Base Esquimalt. Once there, its artificial intelligence emerged in holographic form and informed those present that the artifact was a seed, a ship containing the nanotechnology and resources required for it to produce a new colony on any suitable world it landed on. It had unfortunately landed in a lava field, become encased in the rock when it cooled, and eventually sunk beneath the rising sea. She introduced herself as Pip and presented the World Governments Federation with an offer.

In return for helping her to continue her mission and find another world where she might start a new colony, she would transfer all of her people's technological knowledge to Earth. She clarified that while civilization on her home world and in its star system had existed for close to a million years, scientific progress had begun to yield diminishing returns in as little as twenty thousand years since it first arose due to the

limitations imposed by physics. As Pip insisted on being in control of the process and proceeding responsibly, it would take centuries or more to complete the technology transfer.

When Raiden had inadvertently created a fully conscious AI, which they had temporarily placed in a state of stasis, she was faced with the ethical issue of its future. Tamiko had come up with a solution. In her earliest forays out into the world, Tamiko had met one of Raiden's wealthy neighbors, an elderly woman named India who was in the final years of her life. Her daughter Lena had passed away early in her adult life and India had replaced her with an identical Companion. Now with her own passing imminent, India was concerned for Lena's future. Tamiko proposed that the conscious AI she and Raiden had created replace the AI in Lena, which was not self-aware. India agreed and filed the necessary papers to make both Lena and Tamiko incarnate, a legal term meaning they were free from ownership. This allowed them to inherit, and after India's passing, they inherited her house and the rest of her estate and made their home there.

Some time after the WGF agreed to Pip's offer, she contacted Lena and asked if she could join her and Tamiko in their home while she waited the long centuries for Earth to be capable of helping her continue her mission. Lena and Tamiko provided a second generation Companion shell which she could occupy. She took the name Pippa and confided to her new friends that she was not only an artificial intelligence but was the result of a merger of the AI required to operate her ship and the young woman she had once been on her home world. It was this ability that Raiden saw as a possible way to combine an AI produced using her own genotype, knowledge, and memories with an AI produced from the unadulterated and complete genome of one of those with extreme intuitive abilities.

As humanity did not yet have the technical skills to create a working values system, and Pip had not yet reached the point where she was prepared to transfer the technology, the people of Earth believed there were as yet no fully conscious AI other than Pip. There were no laws regarding their creation. The laws against the use of entire genomes were still in place however, so Raiden once again proceeded in secret. She asked if Tamiko would produce another AI from the complete genome she had located and acquired and asked Pippa if she would merge it with an AI created from her own genotype, memories, and knowledge.

Shin emerged from her recollections as she stood looking out her office window. The result of Raiden's experiment had been herself, a Companion with the knowledge, memories, and character of Raiden combined with the heightened intuitive abilities of the race of humans Shepherd had bred as part of her strategy to address climate change. With the insight granted by her intuitive abilities, she solved the problem of the mutations caused by gene editing but that had not been the end of her story. The genotype Tamiko had found had belonged to an artist and its influence had resulted in

Shin's own interest in the arts and humanities, leading eventually to her founding both a community of artists and the institute.
She had used the institute to pursue her technical interest in the arts and the result had been Tesni, the first fully conscious Companion produced after Pip finally offered Earth the use of her values system. Unable to comprehend its technical complexities, after centuries of study, the WGF had approved of its use in a black-box approach.

With additional self-aware Companions being produced after Tesni, they began to pursue questions of identity and belonging. Eventually, given her success with the artist's community and the institute, they asked Shin if she could arrange for a parcel of land to be assigned to them. Shin approached the WGF and suggested the idea in return for the Companion's offer to voluntarily participate in the Continuity Project, a plan to send artificial intelligence to extra-solar worlds as a part of Earth's first colonization efforts.

Given that the human race might be extinct before organic colonization could be completed, in that case the Companions sent were hoped to function as a repository of Earth's history and achievements and also to represent as faithfully as possible what it was like to have been a human. Within the community, the issue of spirituality eventually arose. Spirituality was a foundation stone in all human civilizations yet the Companions had none. How could they then be a faithful representation? In their pursuit of a solution, they once again approached Shin.

Her participation in the community's investigation into spirituality eventually led Shin to consider the possibility that spirituality was not an epiphenomenon, a mere side effect of consciousness, but as she had concluded regarding art, another aspect of human intelligence. Her subsequent research into the physical basis of how spirituality might be related to consciousness resulted in the production of Kami, a Companion formed by combining thousands of AIs using the natural quantum entanglement process that occurs during mitosis when the DNA molecule is copied whole into each new cell.

Like Shin, as a result of their unique origins, both Tesni and Kami possessed unique and advanced capabilities. As Director Kiran had said, the three of them were among the most advanced intelligences on the planet. Now Shin felt it was time to meet with them in person, as well as Tamiko and Pippa. And one other, thought Shin.

Perspectives

“Because you are naturally interested in psychology,” Shin replied in answer to Yara’s question.

“Among the vanishingly small number of 3GAI Companions relative to people, there are few of us who have chosen to follow psychology as a career path. Among what little the Lanians have told us about their concerns, they have been very specific about the fact that it has to do with values.

“As you know, when a Companion is naturally interested in something due to their values settings, it is a very different thing than when a person is. A person’s social values are complicated by their biological values. I do not say compromised because it is not so black and white as that. With my personal interest in forms of intelligence other than rational and analytical, I am well aware of the nuances, interconnectedness, and seemingly contrary aspects of human intelligence. Even Shepherd repeatedly stated, that human intelligence was still a mystery to her in many ways.

“Neither myself, Tesni nor Kami have a natural interest in psychology as such. Tesni has a natural interest in music and Kami in spirituality. I am interested in intelligence itself but psychology is something that arises from intelligence, as opposed to being a source.

“While the program here at Helicon concerns itself with the psychology that arises from artificial intelligence, you are interested in human psychology and the issue the Lanians have presented us with has to do with that. The professors that teach in the program here of course have the same traditional backgrounds as you do but their perspective is not yours. They are not on the outside looking in. Nor does their interest reflect the same degree of intimacy as yours does. They are interested in theory while you are interested in practice. We will have input from them and many others beyond this institute, but your perspective is unique.”

In previous generations of Companions, physiological displays of emotions such as body language, facial expressions, and tone of voice were artificially generated. They were simulations. There was no direct connection between what a Companion was thinking and how their emotions were expressed, for the simple reason that they had no emotions because they had no values. Being a 3GAI meant Yara had values. Emotions were required as a way to express her values, for her values to have any external effect. Just as in people, those emotions were normally expressed directly via her physiology unless she consciously took control of them. Like all Companions, Shin had the ability to perceive hundreds of physiological indicators of the internal state of another person or Companion, far in excess of human abilities, and she could do so far more quickly. Shin could easily see that Yara was about to offer a response. She held up her hand.

“There is something else you need to know before you respond,” said Shin. “As you will know from the history I have been involved in as detailed in the Shepherd And Her Flocks series, in all our endeavors we have always included one or more people, not Companions, to help us in our efforts.”

“Fawn,” replied Yara.

“Yes. Although we would not influence or guide her, or interfere with her development or choices in any way, we would like her to be intimately involved in our task of unraveling the mysteries of who the Lanians are and exactly what they want.”

“Because she is young,” Yara suggested, correctly assuming that the other reasons were obvious.

“While that is only a partial reason, it is a major one. As you know at age sixteen her brain is only halfway through its developmental process which will take another ten years to complete. We do not expect to solve the problem of the Lanians overnight. Her brain would develop immersed in the issue and its natural plasticity will result in a degree of focus that is not just mental, but physical. Her natural interests and your relationship with her, are of course the other major reasons.

“The ethics are subtle,” continued Shin, “but I see no conflict. We would withhold nothing from her. She would be under no greater pressure than anyone else who decides to pursue a career at a young age. Whether or not she decides to make the issue the focus of her studies or not would be up to her. We would simply welcome her into our confidence and leave the rest to her.”

“It is also a great opportunity regardless of the outcome,” said Yara.

“I would not present it to her on those terms,” replied Shin, “however it would be understandable if she came to that conclusion herself. There is one other consideration I must bring to your attention. Fawn may more frequently than others be exposed to the fields that both Kami and I produce. Even at a minimum, they have an effect. Via Pippa and others who have the ability for empathetic touch, she would also have the opportunity to engage in communion with one or more Companions should she wish it and the Companions involved deem it appropriate. Depending on the intensity she is exposed to, the impact on her could be permanent in the sense that for a person they are unforgettable experiences. At some point she may feel they are experiences that are required to deepen her understanding. If she is never presented with the choice to join us in our efforts, she will likely never be exposed to such experiences. Should you decide to offer her the choice, I recommend you do not initially mention the issue as such experiences may subconsciously serve as enticements.”

“Thank you Shin, I had not considered that. Can I assume that if I decide to participate, my role as student counselor will be unaffected?”

“Yes.”

“I will get back to you in a few days.”

Although Yara and Shin’s computational abilities would be considered many magnitudes greater than those of the super-computers of the past, such issues as they had discussed were subject to an almost infinite range of branches and possibilities. Value based decisions were not digital but analog in nature and so subject to ever finer degrees of analysis. Like some version of Zeno’s Paradox, where constantly closing the gap between two objects by halfway meant it was never closed, similarly, with analog computing it was not possible to arrive at a final, definitive answer and so at some point a choice, judgment or decision based on probability must be made. For this reason, considerations like those Yara was now presented with took far longer to work through than most other types of problems, even given the power of focus and other abilities Companions had.

“Thank you Yara,” said Shin.

Threshold

Wandering along the walkway that followed the ground level edge of the quad at Helicon's northern campus, Yara explained the project to Fawn, why she had been invited to participate, and that she had decided to accept Shin's offer. She had not yet mentioned the possibility of Fawn's own involvement.

Apparently Yara knew her daughter well because the first thing Fawn said in response was, "Wow Mom, what a great opportunity!"

Over the years Helicon had grown to be one of the most highly-ranked academic institutes with regard to studies in artificial intelligence. Software and hardware were not its strong suits but following the development of practical AI in the early twenty-first century those aspects rapidly moved to the background while issues related to the humanities, such as justice and ethics, became the primary focus of public interest. As had occurred in the past with other technologies such as cars, computers, and entertainment, the emphasis had shifted to what AI did, not how it did it.

While Yara's role at Helicon was enough to ensure her future success, any research work involving close association with Shin and her inner circle was the gold standard of credentials in the field.

"It is, and I appreciate it, but that's not why I'm doing it," replied Yara in an effort to try to temper Fawn's own response to possible involvement. "I'm just doing it to try to help. My primary interest remains my counseling work, and I will be continuing with that."

"Must be nice," teased Fawn, referring to the degree of Yara's multitasking ability. "Will you be able to talk to me about it?" she asked with sudden concern, knowing that any WGF related work might be considered confidential at the very least.

Now that Fawn had asked her question, Yara decided it was time.

———————

"Hello Fawn," said Shin, extending her hand, "I'm pleased to meet you at last."

They were meeting in Shin's office.

"Hello Administrator Shin," Fawn replied respectfully.

"Just Shin is fine, thank you. Though you will have only received formal communications regarding me previously, my title is rarely used outside of those. Please," said Shin, gesturing to the sunken seating area in her generous office.

“I appreciate that you have decided to become involved in this effort. Let me reassure you that, as Yara told you, we will not attempt to influence or guide you or interfere with your development or choices in any way. That would be counterproductive and negate the very reason for our interest in your participation.”

“Because I am young,” Fawn said, repeating what Yara had told her.

“Yes. As I’m sure Yara explained, and as you will learn in greater depth in your studies, although your brain has finished growing physically in size, it is only about halfway through its structural development. Over the next ten years, most of that will take place in the prefrontal cortex area of your brain and involve two broad areas of focus; organization and self-regulation. These fall under the general classification of executive functions, which the prefrontal cortex is largely dedicated to. Organizational functions include things like focusing attention, planning, problem-solving, and abstract thinking, while regulation deals with things like self-control, moral reasoning, and decision-making. The reason for their delayed development is that these are largely social skills and require experience in the social environment in order to be established.

“Research has shown that due to brain plasticity, meaning its ability to physically adapt, the subject of an individual’s interests and focus will cause certain areas to physically grow larger, with more neural connections than it would otherwise, much like muscles grow in response to use. It may be that your natural interests lead you to another academic focus however if this project does resonate with you, your brain will respond accordingly.

“Lastly, just as we will not attempt to influence you or your choices in any way, we do not have expectations of you any more than we have expectations of the others involved. This will be a process of discovery and we have no way of knowing which path or paths might lead to greater understanding. We are simply trying to apply as many different perspectives as possible to the problem.”

In response, for a few moments Fawn simply held Shin’s eyes thoughtfully before asking, “Will this affect my studies?”

“Only in as much as it may appear to influence your interest in particular areas of psychology. If that appears to occur, it will in fact only be that the project aligns with your natural interests. Your natural interests will always dominate. In practical terms, it will initially take little of your time however if the project stretches into your postgraduate years you may decide to devote more of your time towards it, your master’s thesis or PhD dissertation for example.”

Observing her closely, it appeared to Shin that Fawn was close to making a commitment.

“There is one more issue I must raise,” she said now. “If there is an ethical issue with your decision it is that at age sixteen, in the absence of the full development of your executive functions, your decisions are still largely made by the portions of your brain that deal with emotions. Yet only someone your age can offer your potential contribution. The only way to attempt to deal with the ethics of the situation is to make you fully aware of this. If both you and your mother agree to your participation, I will accept that.”

Before Fawn had a chance to respond, Shin said, “If that were not enough, there is the issue of my intuitive field and its effect on you. Are you familiar with it?”

Fawn furrowed her brow as if concentrating. “I can’t recall.”

“Because of the unusual nature of the design of my AI, I produce a field which will cause any person in close proximity to me to have greater access to their own intuition. It does not influence others but it will affect them, especially their decisions. It enhances the functions of the older, emotional parts of the brain, the parts you are relying on now to make decisions, not the areas involved in executive functions. Because of this, it causes others to trust me more. It also enhances my charisma which in simple terms means it causes others to like me more than they would if it was not present. I can increase the strength of the field but never turn it off entirely. Given the presence of my intuitive field, I do not want you to make your decision now. I would ask instead that you go home and take as much time as you want to decide whether to join us or not.”

Fawn was feeling more awestruck than she had been prepared for, as if for the first time nearing the deeper end of the pool regarding the project and its implications.

“Does my Mom have this field?” she asked.

“No. Only I and another Companion you may meet in time have it. We are unique and no other Companions produce this effect.”

Dawn looked absently at Shin as if trying to connect her mind to the feelings Shin was describing. She acknowledged to herself that she did feel an instinctual liking for Shin but she thought that perhaps she would have anyway.

“Alright,” she said at last. “I’ll let you know. Thank you, Shin.”

Knowing

Fawn almost always hiked alone. Alone as she could be, given the AI and other intelligence in her phone. It would be tracking her physical state and location constantly. She could turn them off but that was irresponsible when hiking alone.

She stood at one of the Horth Hill Regional Park's viewpoints looking south over the Saanich Peninsula. She knew Vancouver Island was the top of a mountain range but the peninsula was mostly flat and sandy, the sand having been deposited by the glaciers that had once been two kilometers thick where she stood.

Growing up at Helicon, Yara had seen to it early on that Fawn was on familiar terms with nature. She had not wanted her to feel comfortable only on sidewalks and groomed lawns, so even as an infant she had regularly packed Fawn into a baby carrier and visited whatever nearby bit of nature she could walk to or conveniently get to by public transit. Fawn grew up feeling as at home in the depths of an evergreen forest or scampering along the rocks and logs of a nearby beach as she did at the campus. Her sense of the meaning of the word 'home' was large.

There was plenty of green space at the campus but that was not the same as nature. Unlike the more populated parts of the island, there were large areas of the peninsula still undeveloped, with forests large enough to take an hour or more to traverse. Bounded on three sides by inlets, channels, and passages, there were numerous waterfront parks and beach access trails.

As early as possible in Fawn's development, Yara had told her the names of the things they encountered – trees, bugs, fungi, or marine life – explained what they were, and answered any questions she had about them. When she had been old enough, Yara had taken her up to the lookout on Horth Hill and told her about the mountain range they were standing on top of and the glaciers that had left behind the rolling hills of sand. By the age of ten, Fawn took it for granted when she encountered some new plant or rock formation that she would look it up.

Out of her interest in nature, she had developed an interest in science in general, a view of the world that was geologic in its scope. She had investigated what was known about how life had begun, how human beings had evolved, how civilization had developed, and now as a young adult, how the inner workings of the mind modeled and dealt with what it thought of as reality.

After speaking with Shin she had felt the need to take a break and decided to hike up the hill. It was only a kilometer from the campus, a ten-minute walk, and so it was somewhere she often visited. She had wanted to think but had recently noted that she wasn't really aware of what she was thinking when she was hiking. After a hike, she

often found it impossible to recall just what she had been thinking, just as it was often impossible to recall her dreams. Instead, her awareness had been occupied the entire time with where she was going to put her foot down next. Yet she would come back refreshed and relaxed, her thoughts untangled and her sense of the path ahead more certain.

As she stood looking out, two young women on horseback came up behind her and stopped well back from the edge. Fawn turned and smiled. Pointing to one of the horses she asked, “May I?” The rider smiled in return and nodded, so Fawn approached and gently stroked its head as it looked at her with its great, fathomless eyes. Looking up at the rider she smiled again and the two of them, without a word, turned their horses to continue on their way.

Fawn watched them go and then walked to the lookout’s guardrail, leaning on it. She had come up here to think about Shin’s offer and somehow now she knew her answer. She became consciously aware for the first time of the mental experience of knowing as opposed to thinking. Knowing didn’t have reasons any more than the riders needed words to tell them she was done petting the horse. She didn’t tell them she was done, and they didn’t ask, but she was and they knew. How did they know? She realized she had known like this her entire life but not been conscious of it. It was something that was taken for granted. She was struck now by the blindingly obvious; all animals knew without thinking. But how did they know?

“Some things are instinct. Some things are learned,” said Yara upon Fawn’s return home. “It depends on the organism.”

“But how could the rider and I have communicated like that? Maybe my smile had just meant I was enjoying petting the horse, not that I was done.”

“Hundreds of pieces of non-verbal information were being communicated between you and the rider, almost all of which neither of you would have been aware of. In particular, fine details about your facial expression when you smiled told her your smile meant that you were done.”

“Why aren’t we aware?”

“The kind of consciousness involved in rational thought is actually incredibly slow compared to the unconscious processing of information you do. Your brain would be overloaded if it had to consciously consider everything it was aware of. Besides, the brain first appeared a half-billion years ago while language only appeared a few hundred thousand years ago. The kind of thinking you are aware of is the newcomer. For hundreds of millions of years before that, human beings knew and communicated without thinking, just like all the other animals. Just like you did with the rider. And the other rider and both their horses for that matter.”

Fawn had learned that there were times Yara used the pronoun ‘you’ with a specific meaning.

“What about Companions,” Fawn asked now out of curiosity.

“As you know, consciousness in both people and Companions arises as an emergent phenomenon but our brains and bodies are very different. It is a matter of necessity and design. For example, both people and Companions observe non-verbals and organize and act on the information within milliseconds but Companions can be aware of that information if they so choose while people largely cannot. Your brains are not designed to work that way. It is normally not necessary for you to be consciously aware of the information that enables you to know something, and evolution has optimized your brain accordingly.”

Fawn’s eyes took on a faraway look. She had a thousand more questions but, as a young adult only just emerging from puberty, her awareness was overwhelmed by her feelings. Perhaps it was just the two things being dominant in her mind but somehow she felt her experience with the rider had something to do with the Lanians.

Kami

“Just what is intuition?” Fawn asked. She was walking with Shin from her office to meet Kami, another member of the project team. Fawn had told Shin about her experience with the riders and wondered if it was the same thing as intuition.

“There is no definitive answer, only a theory,” Shin replied. “What people call intuition has been suggested to be an intermediate step between instinct and rational thought. A pre-linguistic form of reasoning. It’s not considered instinctual because instinct does not involve reasoning. Instinct operates more like old-fashioned software programming, where behavior is all hard-coded. When an alligator jumps out of the watering hole at an antelope, there is no time for reasoning, the response is automatic and virtually instantaneous.

“Yet it is clear that many animals carry out tasks that require reasoning and this is thought to be a process where memory and the older, emotional parts of the brain are used to reason based on learning. Until the rise of neuroscience, the idea of rational thought being possible without language was denigrated but as brain scanning technology improved it was able to show that reasoning did not actually take place in the same areas responsible for language. Although their ability to understand or perform speech or writing was impaired, individuals with injuries to areas of the brain concerned with language were still able to reason. It’s also been found that some people do not have a voice in their head by which they hear themselves think. Instead, they are only aware of images, sensations, and emotions as they reason through things. According to the theory of intuition, language is used to communicate, not to reason. What you refer to as knowing, sounds very much like the theory of intuition.”

When they arrived at the Center For The Interdisciplinary Studies Of Values where Kami had her office, Shin said, “I will not join you in your meeting with Kami. She will meet you inside.”

The center was not only where the institute conducted its research into human values but also served as its spiritual and counseling offices. The central area of the building was a circular, open area used mainly for meditation or other spiritual practices. Entering the main lobby, Fawn was greeted by a petite Asian woman.

“Hello Fawn,” she said with a slight bow, “I am Kami, the administrator of the center. Please, come with me.”

Kami’s office was large and contained a suite of comfortable overstuffed chairs like those that might normally be found in a living room or hotel.

“Please,” she said, gesturing to a seat.

Taking a seat herself, Kami said, “Tell me, how are you feeling right now?”

Although surprised by the question, Fawn did not stammer or hesitate in her response. She simply assumed Kami had asked it as a routine part of her role as a counselor, something she was familiar with since her Mom performed a similar role.

“I feel good,” she replied brightly. “Yesterday I went for a short hike and I had a good sleep last night. I’m happy to be starting here at the institute and excited about the project.”

She was aware however that she felt somewhat more alert than usual. Like after she had a cup of coffee. Kami did not need Fawn to tell her this.

“While I serve as the administrator of the center, I also have counseling duties. It is in fact the latter that is my main focus here. As you know, when manufacturers produce a 3GAI Companion they have a legal duty to provide the necessities of life and assistance towards the Companion finding a place in society. My AI was produced here at Helicon and Shin was kind enough to offer me this position. She did so because of my particular ability which is due to the unique process involved in my development.

“The community of 3GAI Companions at nearby Continuity Zone Seven is a part of the WGF’s mission to send Companions to extra-solar worlds. The goal is for them to lead the way towards hopefully enabling people to one day follow, although that technology is not yet settled on. As a secondary function, should the sending of people not turn out to be feasible due to the challenges of space flight, it is hoped they would in that case act as your descendants in themselves and as a memory of what it was like to be a human being.

“However it was soon realized by the community that they lacked one of the foundation stones of all human civilizations. They had no spirituality.”

Fawn had read the series of novellas that contained the story but it had been some years ago and she did not recall the details.

“Spiritual practice,” Kami continued, “generally has two paths; the path of awareness and the path of virtue. This center is the result of the institute’s interest and investigations into the path of virtue, the expression of values. I am the result of CZ7’s investigation into the path of awareness. Shin had become involved in their efforts and was particularly interested in the question of whether or not there were degrees of consciousness. In medical literature, consciousness is normally described as wakefulness, awareness, or alertness and focuses on what might negatively impact it. Shin however was interested in the question of whether or not it could be enhanced beyond normal levels, something spiritual practices often talk about, referring to raised states of consciousness, but provide no scientific basis for.

“Among the theories of consciousness, one of the most historically popular has been the idea that it results from increased complexity. We now know that it is values that produce consciousness but increases in complexity can enhance it. The design of my intelligence included a large increase in complexity, but to have any effect complexity must be tightly coupled.

“During the process of mitosis, cell replication, the DNA molecules are in a state of quantum entanglement. Using DNA as the basis for artificial intelligence and replicating it in this way results in identical instances of an AI that are entangled. My AI was produced in this way by entangling thousands of copies. The result is an increase in perception. The level of my sensory awareness remains the same as any other Companion, for example we can all see ultraviolet light and hear infrasonic sounds, but I am able to perceive deeper meanings, implications, and inferences from what I sense.

“Consciousness behaves in a manner similar to gravity, meaning the more there is the more it affects others around it. Due to this, like Shin I have an effect on those around me which is why she did not accompany you here. The field I generate is not of the same nature as hers. Mine results in a sense of heightened perception. In my case, the effect is that those in close proximity to me feel a heightened sense of alertness not dissimilar to the effect of some psychoactive drugs. They feel more alive, are more aware of their surroundings, and experience greater clarity of thought.”

Kami’s ever-present cherubic smile seemed to deepen a little, as if to say that she was well aware of Fawn’s current feeling of heightened awareness.

“Thank you for explaining Kami. I realize now that I am aware of the effect. I assume this is why the WGF asked you to participate?”

“Yes. It is hoped that I may be able to perceive some aspect of the problem others do not or that my presence may produce an insight in another.”

Standing up she said, “Now I will walk you over to meet Tesni. Her home is just on the edge of the campus. She too was produced here at Helicon and is the first of all those produced using the alien values system. Her unique ability does not come from that however but from what she was before.”

Tesni

The blue light that had once indicated the Electromagnetic Pulse Field surrounding Tesni's home had long since been deactivated. As the first Companion known to the public to be fully self-aware, there had been concerns for her safety. The 2GAI Guardian model Companion that lived with her remained ostensibly as her household assistant.

As Tesni worked at the institute, her home was located in a wooded area just outside its official boundaries, however all the institute's infrastructure and security services were extended to it. At the boundary, Kami departed, telling Fawn that Tesni was expecting her.

"Hello Fawn," Tesni said opening the door with a welcoming smile as she approached. "I'm pleased to meet you. Please come in."

Tesni's home was architecturally modernist in style as were all the campus buildings as well as the homes at the artist community. After the climate emergency of the early twenty-first century, the modernist style became dominant and had remained so due to the mandated requirement for the use of sustainable materials and standardized, reusable elements. Almost forty percent of greenhouse gases had come from the construction industry and this could not be allowed to continue.

Tesni's living room was large with a double-height ceiling. Minimalist in its decoration, what caught Fawn's attention was the grand piano that stood by the window.

"Yes I do play," said Tesni. "It allows me a greater range of expression of my particular abilities than my work does."

Just then Tesni's personal assistant entered.

"Hello Fawn," she said. "My name is Shamira. I am Tesni's household Companion. It is late in the morning and I am wondering if I can get you anything to eat or drink? I can access campus food services regarding your preferences."

"Yes, please. Thank you Shamira."

Tesni gestured to a small seating area.

"Unlike Kami and Shin," she began, "I produce no external field that might influence anyone. My unique ability takes place only internally. It is the ability to switch the weighting of the values that the alien system outputs and to do so very quickly. The values system was originally designed to be used by the Companions that Pip and her ship would initially build as the first step of the colonization process. Those Companions

would go on to construct and develop the infrastructure required to use the DNA stored on board to birth the first living colonists via artificial wombs. There was no need for highly individualized Companions in this scenario. The default system outputs only one combination of values.

“During Shin’s research into how the brain creates and perceives art, it was discovered that the cerebellum, an extremely dense part of the brain, coordinated all the brain’s activities, not only with regard to art but with everything it perceives and responds to. In evolutionary terms it is a very old part of the brain and originally only coordinated the physical aspects of the body, things like spatial awareness, balance, and coordinating limb movements. With the evolution of social values, language, and other forms of expression and communication, there was a need for the coordination of perception and the responses of these as well. The cerebellum adapted to the new environment. If a teacher turns to answer a student’s question, the cerebellum is what enables them to move fluidly, make eye contact, and produce an appropriate facial expression, tone of voice, and if a smile is appropriate, it enables the teacher to smile, just so. All these inputs and outputs must be coordinated somewhere and that somewhere is the cerebellum.

“Like the rider,” offered Fawn assuming correctly that the Companions would now be sharing everything about her in detail.

“Yes, like the rider. Your cerebellum produced exactly the smile to enable the rider to understand your meaning, even if you were not conscious of it yourself.

“Performing brain scans of the cerebellum region had previously proved impossible due to its density and the speed at which it processes signals. While taking up only ten percent of the total brain volume, three-quarters of all the brain’s neurons are found in the cerebellum and it far exceeds the rest of the brain in the number of its connections. The density means the fibers and connections measure in nanometers and conventional scanning methods affected the area being observed and so could not be used. Eventually, a scanner using neutrinos, which have no charge and almost zero mass, was developed for the purpose. However neutrinos move at better than 99% of the speed of light, so an extremely fast AI was required to operate the scanner. The device was developed here at Helicon and is known as a Tesni Scanner. I was the AI developed to operate it.

“Social values produce consciousness as an emergent phenomenon arising from the need for a sense of other and that the other is separate and may be different, but values are also the basis for character and identity. As Canadian law prohibits the development of 3GAI for predetermined purposes, a way needed to be found to randomize the values system’s outputs to produce a unique AI in every case. A new component called the Integrity System was developed here at Helicon for this purpose.

“The resulting 3GAI have the ability to subsequently alter their values set, as it is essential to learning, however since values are the basis of character and identity, it is normally done very slowly, over the course of many years. Even though our values set only includes social values, it must still be done with care. I however have the ability to change my values set and to undo those changes as quickly as I require, and given the extreme speed my AI was originally developed with I can do so at speeds suitable for research purposes. Instead of one scientist analyzing the data from an experiment over the course of a single day, I can produce the equivalent of thousands of different scientists performing the same task in the same amount of time. It is useful both in terms of replicating results and also in providing different perspectives of the same data.”

“Do you do this all the time?” asked Fawn looking at Tesni with something like awe.

“No,” Tesni said smiling in reply. “Normally I do so only when it is required by my work of administering the Tesni Scanner project. Your sense of identity comes from your values, what others perceive as your character. Everything a person says or does is motivated by their values. They are the ultimate answer to the question of why we say or do anything. If my values were constantly in a state of rapid change, I would have no basis for my behavior. It would be as if I had no values. I maintain the set of values I was created with as the default, as my core self.

“The other time I engage my ability is with music,” Tesni said glancing towards the piano. “Composers with different values produce different compositions based on the same ideas and performers with different values will each play an identical piece in their own unique way. I find that engaging in music this way helps me see how values interact synergistically. As you know, science tends to pursue understanding by analyzing things in greater and greater detail while art takes a holistic approach by combining concepts as a way to seek understanding.”

Standing up and walking over to sit at the piano Tesni said, “I’ll play the same piece with three different value settings.”

As Fawn listened she reached an understanding of what Tesni had been explaining to a degree that no amount of explanation could ever provide.

The Generalists

After the stories that told the histories of Shepherd and the other Companions associated with the founding of Helicon were published, Shin decided to move to a new home and convert the one at the artist community into a retreat. The new house had a similar courtyard design and was set in the wooded area between the community and the institute.

Greeting her at the door, Shin's household Companion said, "Hello Fawn. I am Azumi. If you would follow me, I will take you to the others."

Azumi showed Fawn to the central courtyard, where she was met by a petite young Companion with a somewhat androgynous appearance.

"Hello Fawn," she said, offering her hand as Azumi departed. "I'm Pippa."

While it was known that Pippa spent most of her time at the institute, Fawn had not met her before. Yet she was struck immediately by the feeling that she somehow knew her, knew her as a friend. She found herself held by Pippa's steel-grey eyes and Fawn did not immediately release her hand.

"It's nice to meet you," she replied at last and with a slight smile of embarrassment released Pippa's hand. Pippa's enigmatic expression never wavered.

"Please," said Pippa gesturing to a nearby seating arrangement. "The others will join us momentarily."

"As with Kami," Pippa said as they took their seats, "Shin wanted you to meet me without her being present. I do not generate any kind of field like those of Kami and Shin but instead, I am capable of empathetic touch. The electrodermal properties of the skin of people and Companions allows me to communicate via touch."

"Ah," Fawn said involuntarily, suddenly thinking about her hand.

"It can be a mild but noticeable sensation as you have just experienced or if I wish it can communicate strong emotions and thoughts. Our species' development of speech was delayed due to the evolution of communication via touch. Eventually we needed more detailed, quantified, and of course less intimate forms of communication, so speech, writing, and mathematics developed just as they did in your own species.

"Aside from bringing my alien perspective to the task, this is another reason Shin has asked me to participate in this project. Are you familiar with the practice of communion?"

“Only that it’s a way Companions can communicate.”

“Normally people cannot engage in communion,” said Pippa, “but using my empathetic touch I can facilitate it. Should you feel the need arise, and I and the others are in agreement, you would be able to engage in communion. We will not do so lightly however, as both empathetic touch and communion have lingering neurological effects on people. The stronger they are, the more you will miss them.”

Fawn only nodded absently while Pippa held her eyes. She could imagine from her brief experience what it might feel like.

“As well as Shin, I have also enabled empathetic touch in the Companion shells of Tamiko, and Lena, who you will meet shortly, but unlike the fields of Shin and Kami, it can be entirely disabled. Lena has intuitive abilities similar to Shin’s and from the same source, although not as strong. Lena, Tamiko, and I have a general role here at Helicon acting as project leads, lecturers, or facilitators as required. Tamiko has the ability to create an artificial intelligence using DNA, something your scientists are not yet capable of. It was she who created Kami.”

At that moment Shin and two other Companions Fawn had not met before approached.

“Hello Fawn,” said Shin, “and thank you for coming. This is Lena,” she said gesturing, “and Tamiko. Like Pippa, I have known them since before the establishment of the institute.”

Lena had the appearance of an attractive middle-aged woman of European descent and Tamiko that of a Japanese woman in keeping with her name. After the three seated themselves Shin said, “We will meet with you regularly from now on but not too often so as not to disturb your studies. This will be a process of discovery and we have no idea how long it may take. We will share our thoughts with you and anything we learn from the WGF. As you can imagine they have a global network dedicated to working on the problem.”

“There are several threads to follow,” said Tamiko. “Who are the Lanians and what do they want? Why are we unable to detect any sign of their presence other than the holograms? Lastly, how is it that they are a hostile alien civilization when Shepherd had assured us such a thing was impossible.”

At this last point, Fawn looked at her seeking understanding.

“Shepherd repeatedly said it was impossible for an alien civilization to achieve interstellar abilities while remaining hostile to others,” Tamiko explained. “They would not develop the necessary trust in artificial intelligence to the point of becoming dependent on it for their survival. At this point, we still know of no way to enable living

human beings to survive the trip. Only DNA might survive, and that would mean that just as with Pippa's ship, AI has to be trusted to reanimate the species once a successful journey has been completed.

"As long as the biological values behind emotions and behaviors like fear, greed, and competition remained dominant, power struggles would delay the process until it was too late. Thus, Shepherd said, any civilization that did achieve interstellar travel, would have evolved to the point where the social values of trust, altruism, and cooperation had replaced those biological values.

"This was a major reason the WGF supported the Accelerated Evolution Program. There had initially been concerns raised about it for this reason, that if Earth's humans were entirely trusting and open, it would be vulnerable to a hostile alien invader. It was Shepherd's repeated reassurances that such a scenario was an impossibility that had resulted in the WGF supporting the project."

"At this point," said Shin. "We would ask that you please re-read The Shepherd and Her Flocks series of novellas if you have not done so recently. They will provide you with critical background information regarding previous events and the histories of myself and the other Companions you will be interacting with here at Helicon. Take as much time as you need and if you wish you can meet with any of us at any time. You now have faculty status, full access to the institute's resources and are welcome to meet with anyone here, at the artist community, or at Continuity Zone 7 if you have any questions."

"The Continuity Project?" asked Fawn, not seeing how it fit in.

"As a part of the Continuity Project, the Companions at CZ7 are dedicated to leading the way to other worlds on behalf of humanity. With the arrival of the Lanians, their intended role in ensuring the future of humanity has become redundant."

A Shared Reality

Fawn and Yara were sitting under the heat lamps of an outdoor café on the northern campus quad. Fawn took a sip of her hot chocolate before saying, “I didn’t realize it would be so much. All these new relationships. I mean, they are all incredible but, I guess I’m feeling a bit overwhelmed.”

“I agree that the timing is unfortunate but I expect the deluge of new information will slow down now,” Yara replied with a reassuring smile. “Most people feel the way you do when they start a new job. They meet a bunch of new people, have to learn a bunch of new stuff, and when they get home at the end of the day it’s all a blur. Feeling anxious or overwhelmed at the beginning of a new job or a new project is perfectly normal and the feeling usually passes in a few weeks.

“Maybe just try getting to know your new friends one at a time. They’ll become less of a blur that way. I think if you just focus on that, your feeling of overwhelm will soon go away.”

Yara knew that getting to know others in a new situation was the best way to reduce anxiety but she also knew there was no shortcut. It would take time. Meanwhile, she thought that changing Fawn’s frame of reference might help make the situation seem less strange.

“Consider yourself a theoretical research project,” she said teasingly.

As Yara was sitting at right angles to her, Fawn responded with a sideways glance and a raised eyebrow.

“Applied research is the kind most people are familiar with,” said Yara. “Like when people work to solve a specific problem. For example, research towards curing a disease, improving crop production or energy efficiency. Theoretical research instead seeks to gain a better understanding of something without any expected outcomes or results. People investigate how genes work for example, without trying to solve a specific medical problem, in the belief that something good will come out of the research at some point. There are no deadlines and no expectations. Most people have forgotten, but Companions based on third-generation AI like myself are also a part of a theoretical research project.”

Fawn turned to Yara with a more explicit questioning look.

“3GAI Companions cost a great deal of money to produce yet the manufacturers are not permitted to own or sell them. So why would they make them? Why would they spend the time and money trying to improve them? Partially because the government pays

them to. Governments are the main source of funding for theoretical research. Both parties believe there will be some unknown benefit that will be useful down the road. The manufacturers hope they will find something that can be used in their products that are not self-aware, the ones they profit from, and the governments hope some new scientific discovery will lead to an advancement in the quality of life. From either perspective, it is actually a small investment with potentially large returns.

“That’s the real reason I exist. Yet I don’t have to do anything. To expect me to do anything specific, to try to influence me to do anything specific, would actually be contrary to the spirit of the research. Your role in the project is no different.”

Observing Fawn, Yara could see that her mind was running off on a number of paths with this revelation. They would run their course in her subconscious and emerge in a more concrete form in time. Fawn nodded and made a small sound of agreement. Putting her drink down she looked at it for a moment. Looking up she asked, “How do you feel about being a theoretical research project Mom?” Her tone was not challenging but simply curious and slightly amused.

“Every life is a theoretical research project isn’t it? We all hope some good will come of our existence although we don’t start out knowing what it might be. Ideally there are no expectations placed on us and we are allowed and encouraged to grow and develop in our own way. My awareness that both people and self-aware Companions like myself share this reality makes me feel a greater sense of connection and belonging.”

It was no accident that Yara brought the conversation around to the issues of identity and belonging. Like many adoptees, Fawn had done her own research into the most common issues. Yara was of course familiar with the psychological issues adoptees dealt with but she never explicitly mentioned them.

There were two types of adoption, open and closed. Open adoptions encouraged communication and interaction with the birth parent or parents, while closed adoption meant there was none. Under normal conditions, both options were available to adoptive parents and each brought its own challenges. For children made available for adoption due to enforcement of the population reduction mandate however, only closed adoption was permitted.

As a Canadian citizen, under the Human Rights Act law regarding Prohibited Grounds of Discrimination, Yara’s right to adopt Fawn could not be denied. Perhaps the government also had its own reasons for ensuring it was approved – if the Continuity Project was successful, the first generation of humans born on a new world would be raised by Companions.

Regardless of how it had come about, adoptions of either kind brought the potential issues of rejection, loss, and grief but adoptees involved in the closed approach were

much more likely to face issues of identity and belonging. The adoptee may not look like their adoptive parents or not have the same nature or interests. Due to cultural differences, issues relating to international adoptions were a major component of the government training programs all adoptive parents were legally required to complete. Racial or cultural differences might not always be apparent, especially if a child is adopted at birth, but the difference between Fawn and Yara, a human and a Companion, was inescapable. Yara knew she would have to pay close attention to the issues of identity and belonging in Fawn's life.

It was difficult to tell the difference between a person's nature or personality and psychological issues. Being overly introverted or extroverted may simply be one's nature and not an indication of an underlying issue. Fawn had never developed close friendships. Yara observed that she kept others at arm's length, never becoming overly intimate, even with the few friends she had engaged with sexually. Her innermost feelings she shared only with Yara and it was always Yara she turned to as her touchstone, the one she expressed her deepest feelings to, the one she turned to when seeking understanding of herself.

Whether or not this was an attachment issue was not readily apparent as it caused no problems for Fawn. She had always participated in activities and gotten along well with others. She was self-confident and tended to have a positive outlook. Yara was familiar with all the indicators of good mental health and was more than satisfied with Fawn's development. She did not consider the fact that Fawn was perhaps more serious than others her age, and more studious, to be cause for concern. The opposite, in fact.

She knew Fawn would take her suggestion of getting to know her new friends seriously and pursue it. And she knew that her new circle of friends, coming just as she entered adulthood, would be of far greater value to Fawn than any contribution she might make in return to society. It was a great opportunity.

Hana

Since last visiting with Shin, Fawn had been rereading The Shepherd and Her Flocks novella series as Shin had suggested. The stories were short, easy reading, and she was motivated. The fifth novella in the series included the story of the establishment of the community at Continuity Zone 7 by a number of recently produced 3GAI Companions.

Given her success in establishing Helicon's artist community and institute, their spokesperson Iris had approached Shin to enlist her help. If the WGF would provide them with a plot of land they could call their own, they would volunteer to participate in the Continuity Project.

Despite her Mom's recommendation that she spend time getting to know better the Companions she had recently met, Fawn felt drawn to the plight of those at Continuity Zone 7. With the arrival of the Lanians, the entire justification for the existence of their community was invalidated.

CZ7 occupied a half-square kilometer of land, an area where four hundred residential houses would normally be built. Located immediately north of the institute, it was made clear to all new students that it was private property and not a part of the campus. To visit, they would require permission. Fawn had asked Shin to arrange a meeting with her and Iris.

In the process of determining a common identity, they named themselves the Denshosha, a term based on a Japanese phrase meaning "memory keepers of the people". Once established, in keeping with their adopted cultural name, they named their community Hana, a Japanese word meaning flower or blossom, with the explanation that they were a new blossom on the tree of life.

Iris met her in a small outdoor seating area in front of what Fawn knew was a small bakery and cafe open to the public.

"Hello Fawn. Welcome to Hana," Iris said with a smile and offering her hand.

"Hello Iris. Thank you so much for taking the time to meet with me."

"Can I give you a tour?"

"That would be wonderful, thank you."

"Before we begin let me say that Shin has of course explained your role in the Lanian project. The WGF has told us that the arrival of the Lanians will have no impact on what

we do here or the Continuity Project, as they assume the issues will be resolved and our work needs to go on in the interim."

"Oh that's wonderful," Fawn said with relief.

Iris smiled happily and nodded before gesturing towards a path nearby. "As you probably already know," she began, "our community is centered around grain farming. On any new world there will be physical work that needs to be done and so our daily labors here are a way to stress test our physical shells. If we are successful at reproducing humans, there will be mouths to be fed. It may not be grain but depending on the biosphere some kind of staple food will need to be produced."

The path led from the central buildings out into the fields of grain. "We grow four hectares of grains here, wheat, oats, and barley, and those efforts are subsidized by a federal agricultural research program in which we participate. On any new world, food will also need to be processed and prepared so we also have a small mill and bakery. People may have been farming and producing goods for millennia and Companions are capable of replicating most of the tasks people do, but that is not the same as operating entire farms or industrial concerns independently. We may be as fully conscious as people and as able to learn and to solve new and unique problems, but people took thousands of years to develop reliable farming methods, ways to store harvests, and to improve yields. We will not have thousands of years to do so."

As they walked the paths between the fields, occasionally they passed other Companions who smiled and greeted them.

"But food production and stress testing our bodies is not the only reason we farm," continued Iris. "These are really only secondary considerations. There are Continuity Zones scattered around the globe and each has a specific focus. The main focus of our work here is actually reproduction. Not the reproduction of our bodies, other Continuity Zones focus on that. Here the focus is on the reproduction of our artificial intelligence. Once we reach our destination, we will need to increase our numbers before there are enough of us to support a human colony. People reproduce using genetics and adaptations take place randomly however Companions have no genes nor would we want our adaptations to occur randomly. Again, we will not have the time to risk that. Instead, any physical or mental adaptations will have to be intentional.

"Physical adaptations can be managed in a straightforward manner as required by the environment but mental adaptations will eventually require a degree of randomness for social reasons. As you know the Integrity System is used to randomize the values of all 3GAI Companions. The process includes the entire social set but here, as we will on a new colony, we constrain the set to include only those of two or more parents. This replicates the genetic process mentally over generations."

Fawn turned to Iris at this point with a furrowed brow and asked, “But won’t the increased population of human colonists negate the need for all this?”
Stopping to face Fawn Iris replied, “We must prepare for the possibility that it is impossible to reproduce humans on a new colony world. In that case, we become your descendants and we are dedicated to representing the memory of humanity as closely as possible. To recreate human society you need variation. You need artists, scientists, engineers, and administrators. You need kinship bonds, friendships, and cultures. This is another reason we farm. It forms the basis of our society and provides a way to study the effectiveness of our reproductive strategy over time. Like many things, it can be modeled and simulated but like everything we do it must be field tested.”

They turned to walk on and Fawn soon found herself deep in thought. After a few moments she said to Iris, “Do we assume the Lanians would prevent a colonization process that only included Companions and no intention to reproduce human populations?”

“Over the centuries humanity has gone to great lengths to ensure the values of artificial intelligence were aligned with its own. The WGF took fully two hundred years before it was satisfied that the alien values system was so aligned. Only then did they allow its use. The Lanians have stated clearly that it is our shared values that are the issue. We believe that from their perspective, we are no different.”

The Problem of Perception

Towards the end of Fawn's twice a week psychology class, Professor Rais was saying, "Sensing the world around us, as we have discussed, is a purely biomechanical process. Our five senses of sight, sound, smell, taste, and touch all detect differences in the physical world around us. The differences are converted into electrical signals which are sent to the brain and that is where things become extremely complicated.

"At this point, the physical models end and what happens next becomes a blur of psychology, neuroscience, and philosophy. We know that many external and internal factors affect our perception of the world, but neuroscience cannot tell us how. Psychology and philosophy only offer theories. In other words, how the brain perceives, interprets, and creates meaning from the raw sensory data it receives is a mystery. Perception is difficult to separate into exclusive subjects of study, so we will cover it in an interdisciplinary approach in this course.

"Let's begin with the biggest issue, known in philosophy as The Problem of Perception, which is that within our brains we create a model of the physical world based on the raw sensory data we receive. Is the model the same as reality? Since any perceptual experience can include internal influences, how can we be sure our perception is the same as reality? As we will see from the list of things we know can influence perception, we can be sure that our perception is not the same as reality.

"There are even arguments that objective reality is only a concept since it relies on perception, so the question of whether or not we are perceiving reality becomes irrelevant. Some animals see a more limited range of the same colors people do, others only see shades of gray, and some insects only see the colors in the ultraviolet part of the electromagnetic spectrum while we cannot see ultraviolet light at all. So is an evergreen tree actually green? Does the fact that all people agree that the evergreen tree is green make it so? Does the tree itself actually possess the attribute of color?

"If you are wondering how this might apply to artificial intelligence, the issues are largely the same. If an AI is functioning as a part of a robotic system, it too will receive raw sensory data and have to somehow convert that into something meaningful. For example, do the lines on the floor indicate the presence of colored tiles or stairs? Is that object a phone or a gun? Is that person with the phone/gun a threat or not? For both people and AI, raw sense data is not enough, physical reality has to be accurately perceived before it has meaning. In both cases, it comes down to learned beliefs, expectations, probabilities, and predictions.

"For 3GAI, the problem of perception being affected by internal factors is also no different. What we have largely found with the history of AI is not that it provides insights into the causes of psychological issues that people might have, but rather that it

simply has the same issues for the same reasons. 3GAI makes resolving the problem no easier because consciousness in both humans and AI is an emergent phenomenon with no direct association with the underlying hardware. As far as perception goes, AI has the same problem that neuroscience does.

“The study of perception is a field in itself and we are obviously not going to cover all of it in this course. We won’t spend any time on its history, which goes back over three thousand years. We’ll cover some contemporary philosophical theories but not in great depth and we will do so in keeping with Helicon’s plain-language policy. The different theories essentially propose how the brain goes about the process of forming and settling on a perception and their main differences have to do with the role of what we think of as objective reality. For example, does perception begin with sense data which is then influenced by internals, or does perception play a role in determining what we sense in the first place?

“In this course, in keeping with the AI focus here at Helicon, we will mostly consider internal, environmental, contextual, and situational factors that affect perception. Our physical or emotional state affects our perception as do our personal histories, fears, and interests, as well as our cultural background and our immediate social environment to name only a few. And we are all familiar with optical illusions, instances where our perception is affected by some situational factor like our viewing angle or the placement of other elements in relation to the subject. But all our senses can be so affected, not just the visual. Our sense of time and space, even our sense of self, can all be altered by environmental, contextual, and situational factors. All of these are just as likely to affect artificial intelligence of any generation as they are to affect us.

“We haven’t been able to eliminate most perception issues as far as people go but it might be possible to eliminate some of them with AI. Most of the medical benefits from earlier technology have come from devices that aid the senses, like eyeglasses and hearing aids. AI has already shown how it can improve perception, for instance sociaware implants that help those who suffer from Social Communication Disorder and are likely to miss social cues. Such applications fall into the category of assistive technology and some of you might go on to pursue a career in this field.

“For those of you who go on to work unrelated to psychology, you’ll still need to be aware that AI can have perception issues just as people do. When working with artificial intelligence, the first mistake you can make is assuming that it perceives objective reality. The second mistake is assuming that you do.

“A reminder that the reading assignment this week is the chapter in your text titled Factors In Perception which provides examples of the issues covered today and also the following chapter on the theory of Embodied Cognition as it explains the related theory that cognitive processes are rooted in the body’s interactions with the world.”

At Aylard Pond

Like most academic institutions, over the years Helicon acquired other properties for a variety of purposes. Some years after the development of the northern campus at the abandoned quarry, an adjacent property that had originally been a dairy farm and included a forested area became available. After the climate emergency in 2025, the demand for animal products declined steadily and members of the newer generations of the family that owned the property found other interests. As it was in the province's Agricultural Land Reserve, and therefore off-limits for uses other than those related to farming, selling such a large property would be a challenge.

The family had approached Shin to see if Helicon was interested. Reaching agreements with the local municipality and the provincial body that managed the ALR, Shin agreed to purchase the property. It brought the total campus size to one square kilometer, an area equal in size to the UVIC campus. The large pasture lands would be used for agricultural research. The forested area would remain largely untouched, providing a nature refuge for students, staff, and faculty. The large pond, measuring a tenth of a square kilometer and surrounded by the forest on three sides, would be retained and a walking path with occasional benches would be added.

As agreed with the government bodies, Shin had no intention of farming traditional crops on the large pasture lands. Instead, the institute would research foods made from fungus, algae, yeast, insects, bacteria, and all manner of low-cost foods with small footprints but high nutritional value. A new faculty of agriculture was established and a Studies In Artificial Intelligence For Agriculture program created, with undergraduate and graduate degrees offered.

Fawn regularly visited the path that wound around the pond. It was quiet, peaceful, and gazing at the shimmering surface of the pond she often fell into a meditative state, as she did today. At the sound of footsteps stopping nearby, Fawn looked up to see who it was.

"Mind if I join you?" said the young woman standing by the bench Fawn was sitting on.

Fawn slightly scrunched her face up trying to recall where she had seen the other before.

"Horth Hill," said the young woman. "You petted my horse."

Fawn's face broke into a wide smile. "Oh hi! Yes, please," she said, shuffling over.

"I'm Chanda," the newcomer said, sitting down. "I'm in the agricultural program here. First year."

“I’m Fawn. I’m first year too. In the AI psych program. I spend most of my time at the valley campus but I live in faculty housing here with my Mom. She’s the student counselor here.”

There was a perceptible pause before Chanda replied.

“I’ve met her,” replied Chanda turning to look out over the pond. “This pond is named after my dad’s family, the Aylards. They owned this land for generations before the institute bought it. When I first started here, it sometimes felt a little spooky, you know? I would come and sit on this bench and wonder if I was doing something weird. So I met with Yara just to talk about it. She said that an interest spanning generations in my family should resurface in me was perfectly natural and a very common pattern in genetics. She said it’s called an ‘inherited behavioral trait’ and asked if any of my other relatives had careers related to agriculture. They do. And the fact that my family still lives here in North Saanich made Helicon an easy choice in practical terms. Nothing spooky about it at all, she said.

“But sometimes at night I wonder if I’ll run into a ghostly milkmaid beckoning me,” she said, turning back to Fawn with a laugh.

Fawn laughed in response, aware that it was something she did not often do.

“So am I sitting on ‘your’ bench?” Fawn asked.

“Absolutely. But you are welcome. I was tired of thinking about ghosts anyway.”

“But you came back here today.”

Turning back to the pond Chanda said, “Using land for farming has always been one of its most respectable uses, seen and felt as a sacred trust if done sustainably. But the research here isn’t done on land. It’s done in buildings located on what used to be farmland. The nutritional yields per hectare of things like algae, yeast, and insects are in the range of a hundred times that of animal products, but fifty hectares of agricultural land, all the pasture land from our farm, disappeared when it was sold.”

Fawn did not jump into the gap when Chanda paused.

“Sometimes,” Chanda hesitated before continuing, “there seems to be a disconnect between everything society says and what you experience.” She glanced at Fawn with slight embarrassment before continuing. “So I come here and it helps me get things back into perspective. There’s no doubt what we are doing here is better than traditional farming methods. But what then happens to the land,” she said as a slight crease appeared between her brows, “well, I have to accept that.”

She glanced at Fawn again. “How about you? Did you choose Helicon because you live here?”

Fawn looked down with a smile. “I’m a lab rat,” she said ignoring the others look of confusion. “Administrator Shin granted me a bursary. When I found out about it and asked my Mom she said Shin had offered it to her as part of a package deal to work here. But everyone knows Shin is interested in intelligence in general, what with her artist’s community, spiritual center, genetics lab and her support of the Denshosha. It doesn’t take a genius to figure out that she’d be curious about me. And lately I’ve been wondering if the WGF wasn’t involved in her decision too.”

“The World Governments Federation?”

“I’m involved in the project here at Helicon to try and understand who the Lanians are and what they want. Shin asked me if I would join the project. Because of that, I’ve learned a bit more about the WGF’s Continuity Project. You know, the one about sending Companions to other worlds.”

“To raise children,” Chanda said with a faraway look of understanding.

Fawn only nodded in response.

“Do you think there are others?” asked Chanda.

“Probably. The population maintenance program ensures a supply of children available for closed adoptions, meaning no contact with the birth family, and all the WGF would need would be Companions willing to adopt.”

“Do you think Yara…,” asked Chanda trailing off as she felt she was crossing a line.

Fawn shook her head slightly. “I don’t think so. She explained her reasons to me long before I learned the details of the Continuity Project. Whether she was asked by the WGF or not makes no difference to me. It’s what she wanted.”

Fawn was not sure why she was volunteering so much about herself. A part of her was separate, observing, the part of her that usually shut down conversations and relationships before they got too personal. Her interest in psychology had partially been inspired by this sense of a separate observer and she was aware now that it was observing without judgement or concern.

“But why did Shin ask you to join the Lanian project?” asked Chanda.

“For my brain,” Fawn said turning to meet Chanda’s eyes. “I’m sixteen. Most of my brain’s internal, structural development will take place over the next ten years and what

I think deeply about during that time will affect that. Some regions will grow larger in response to that focus and the density of neurons in those regions will be increased. If I am immersed in the project all that time, Shin hopes the specialized physical brain development that occurs may help to solve the Lanian problem. She thinks of it as bringing another perspective to the problem. So like I said, I'm a lab rat."

"You volunteered for this?" asked Chanda with slight incredulity.

"Maybe volunteering is an inherited behavioral trait?" Fawn said with an ironic smile.

Chanda smiled back in a way that acknowledged there was no way to know and then looked behind the bench at the forest. "Walk?" she asked.

The Trees, For Now

The development of the brain's prefrontal cortex, the region mostly responsible for executive functions like self-restraint, emotional control, organization, and planning, does not begin until around age five. The PFC is largely responsible for the socialization process.

What Charles Darwin had suggested in his book, The Descent Of Man, and Sigmund Freud later echoed in Civilization and Its Discontents, neuroscience had explained with physical evidence. Without the development of the prefrontal cortex, human behavior would be little different from that of any other animal. The brains of most animals change little after birth, while human brains grow three times larger during that period. Ninety percent of that physical growth is complete by age five but the brain's internal structure is not complete until a person's mid to late twenties and most of that structural development takes place in the prefrontal cortex. It takes all this time because it is based on learning societies values and norms.

Children accept the reality they are born into and Fawn and Chanda were no different. They accepted the fact of the Accelerated Evolution Program simply as history. They had no innate sense of being different from previous generations but only understood it from the perspective of their history lessons. Social values had changed many times since the Agricultural Revolution at the dawn of civilization twelve thousand years ago, and technology had always been a factor.

In school, they had learned that human physical evolution had now largely stopped because civilization meant that the human species adapted nature to its needs, rather than the other way around. Even geographic extremes no longer produced unique, local adaptations because city life meant that no matter where on Earth you lived the environment was more or less the same. Under the now largely accepted theory of Convergent Evolution, it was understood that the process of evolution had shifted from genes as the engine behind evolution by natural selection to social values fulfilling that role. As far as the human species was concerned, society had become the natural environment and cultures its ecological niches.

The theory of Convergent Evolution proposed that similar adaptations will arise in similar environments because they are the most efficient adaptations that work with the constants of physics and the laws of nature. Mammals, fish and reptiles all have two eyes, not one or four; birds and bats all have two wings, as do most insects; and leaves, spines and flowers have evolved in separate plant species countless times. Under the theory, social values were considered to be a virtual version of genetics, being mere extensions and refinements resulting from the same evolutionary forces. As Fawn and Chanda had learned, it was not just the versatility of the human body, with its bipedalism and opposable thumbs that had enabled the species to colonize every part

of the Earth, but also its social values that allowed it to adapt to any environment faster than genetic evolution was capable of. If you migrate to a cold climate you don't need to take millions of years to adapt by growing a thick coat of fur, you just cooperate and make clothing.

However the values behind emotions and behaviors such as fear, greed and competition were biological and based in genetics. Removed from the context of the ecological niche they had evolved in, they had become a liability and such a mismatch was always fatal. Waiting a million years or so, hoping they would self-correct before humanity was wiped out by some terrestrial or extraterrestrial event, was not a risk that made sense. So a genetic intervention had been required.

To Fawn and Chanda, all this was simply a part of their school curriculum and like generations throughout history they simply got on with making the best of their lives in the reality they found themselves in. Yet they were undeniably different from all the generations that had come before them. As a result of the Accelerated Evolution Program, they were more trusting, altruistic and cooperative. As teenagers, they were less rebellious and felt less angst over questions of identity and their role in society. The social issues and conflicts science fiction writers of the past had assumed would still be present in future generations were now without basis. After ten generations of selective breeding, the prejudices, biases, and bigotry of the past were alien concepts. The result of the AE program was not a more homogeneous society, but a more accepting one.

Despite her unsatiated curiosity, Chanda was mature enough to realize it would be impolite to continue to inquire into Fawn's personal life but like everyone else she was curious about the Lanians.

"So what do you think the Lanians want?" she asked as they entered the forest.

"You know," said Fawn with a light laugh, "I haven't really thought about it. Getting to know the other members of the project team on a personal basis has been all I've thought about so far. They are mostly the Companions mentioned in The Shepherd And Her Flocks series."

"I suppose that's understandable," Chanda replied with her own laugh. No one who decided to attend Helicon could remain ignorant of the presence of the Companions from the series.

"So what kind of courses do you have?" asked Fawn as they walked on.

"So far it's just been basic history and introductory courses. Business, statistics, basic biology and chemistry, the same kind of general stuff most first year agricultural programs cover. It's really not till second year that we begin to get specific and study things like genetics and biotechnology."

“What about AI?”

“Mostly just history so far. And the pros and cons. The cons are mostly risks, major ones like food security, which explains why agriculture is expected to remain one of the more collaborative industries for the foreseeable future with people always in the loop.

“My family has a history of embracing innovation and sustainable practices so I’m interested in what the ethics and social policy development courses have to say but we don’t go there till third year,” Chanda said with slight dismay. “I’m more interested in that than robots and remote sensing but we all have to start with the basics don’t we?”

Fawn only nodded in reply. The forest had enveloped them, absorbed them like a sponge taking up water. They walked on in silence. Unknown to them, neuroscience had long since established the reason for the common phenomenon. Visually large spaces, like waterfront views or views from lookouts, even forests or large indoor spaces like cathedrals, produced changes in several regions of the brain. Medical monitoring had shown that such views lowered anxiety with a result that perceptual attention expands and with it so does conceptual attention. A focus on details gives way to big picture thinking.

“Ethics isn’t something that comes up till third year in psychology either,” Fawn replied absently while looking around. “I guess the forest will have to wait for now, until we’ve learned about the trees.”

Values

Chanda's question, "So what do you think the Lanians want?" began to haunt Fawn in the following days. It came as a kind of awakening, her confession that she had been so intrigued by the Companions she recently met that she hadn't yet given the original reason behind it much thought.

Now she realized that despite values playing a major role in science, she knew little more about the subject than what she had read about in The Shepherd And Her Flocks stories. Even with all the details about genetics and AI, exactly how values worked on a technical level was never disclosed in the stories. Instead it was explained away as 'something still being worked on'. The only values system that was actually in use was the alien system Pip had provided, and that was being done in a black box approach, the inner workings still beyond the understanding of current science.

"I'm afraid I don't have good news for you," said Professor Alma Vitale, Faculty Head at Helicon's Center For The Interdisciplinary Studies Of Values. Fawn was meeting with her in her office. The subject of human values was something that would come up later in her program, but at her request Shin had arranged for Alma to provide an overview.

"I came here over thirty years ago," Alma was saying. "Before that I was Professor of Biostatistics at the University of Wisconsin–Madison and my research focused on modeling human values in Bayesian networks. I was trying to understand how one value affects another and how the changes propagate across a network. Shin offered me a position here with enough perks to woo me away. Since then a lot of good work has been done towards trying to develop a value system we could use in AI and some of that work has been done here. Unfortunately, none of it has resulted in a system anyone would be willing to deploy in the real world.

"Values systems are incredibly complex and nuanced to the degree that ironically only AI enables us to perform the necessary research. As the saying goes, the devil is in the details and that is all too literal a possibility when dealing with values, where making even a small mistake anywhere in the system can have a cascade effect resulting in unintended consequences. Yet because social values are learned, influenced by situations, and must be able to change if appropriate, they must be probabilistic and therefore contain degrees of uncertainty. They don't exist in a vacuum but rather in a kind of highly dynamic soup interacting with many other physical and nonphysical factors. Values, preferences, goals, beliefs, principles, needs, motivations, attitudes, virtues, morals, ethics and even habits all interact with one another and the rules by which they do so is still not agreed on. Philosophers can argue about it all forever but AI needs a clearly defined system. We've simply never been able to work out a mathematical model that would replicate the way the human values system works.

“Even though we now have the Generally Accepted Model Of Universal Human Values per the International Union of Psychological Science, in practice there is still room for linguistic misunderstandings as people of different cultures may use the same words for values but attach different meanings to them.

“Another one of the biggest challenges we have with producing a workable AI model is that values are among the many things that influence perception. Research shows that different values will lead to different interpretations of the same situation or data, and values influence our ability to even recognize or appreciate results that don’t meet our expectations. How do we prevent this or adapt the process to AI?

“So far we’ve focused on trying to build a simpler values system that produces the same results. However that has also failed to be deployable because without the nuances and uncertainty of the human values system we end up with something too rigid and inflexible, something more like instinct and in terms of social values more like dogma or a political or religious ideology. As soon as you try to give up that degree of control, you end up with an unacceptable level of risk.”

Fawn did not interrupt. Having grown up with Yara, she was accustomed to letting people answer questions in their own way. Companions were always able to understand your deepest reasons for asking a question and usually provided context to facilitate understanding. Fawn generally applied this same listening behavior to people and reserved any questions till they were finished responding. Academics, she was discovering, seemed very prone to responding the same way Companions did.

“Shin asked me to provide you with a high level overview of values and values systems so first let me clarify a couple of things. The alien values system Pip has provided is evidence that while we are currently unable to do so, it is possible to replicate how human values work. We do not as yet completely understand the systems engineering or even the mathematics involved. The gap between what we know and what we need to know is enormous. The situation and scale of the problem is often described as asking a preschooler to perform differential calculus. Yet even that is greatly oversimplifying the challenge.

“So here at Helicon we are trying to understand how values work but only with the aim of producing similar results, not by trying to replicate how they actually work in the human brain. Similar ends but by different means.”

Alma paused and asked, “Good so far?”

Fawn nodded in the affirmative.

“Good,” Alma responded. “Now let’s talk about the current state of values research.”

“The scientific study of the psychology of human values only began in the early twentieth century. Prior to that, values had been the subject of philosophy and sociology. It wasn’t until the 1960s that researchers began to try to define values as psychological constructs, meaning they are concepts humanity has invented to try to explain something so they could be measured and tested. They wanted to move on from treating values as abstractions to empirical research that could be replicated. It was still theoretical research, but it was a step towards the applied research that we do here now.

“It’s important to keep in mind that the challenge has to do mostly with social values rather than biological values. Biological values are things like fear or sexual desire. Those are genetic. Social values are considered extragenetic, meaning they are learned after birth. However social values developed via an evolutionary process meaning the line between instinctual behavior based in genetics and extragenetic behavior based on social values is blurred. For example, infants will display altruistic behavior, a social value, and punish those who act unfairly when they are less than two years old, long before the region of the brain responsible for learning things like altruism has even begun.

“In your psych program, these are all the kinds of issues you will look at in more detail. However the challenge the Lanians present is something else. They seem to be asking us to look beyond all this, beyond the Generally Accepted Model Of Universal Human Values, perhaps beyond the concept of values entirely.”

No Compass

“Beyond values?” asked Fawn, screwing up her face. Over the past centuries, the role of values in human psychology had ballooned from being a pseudoscience prior to the development of practical artificial intelligence to being accepted as the very basis for consciousness. Values at some level, whether based in the DNA of life itself, the genome of a species, the genotype of an individual, or based in personal or social psychology, were accepted as the ultimate basis for all decision-making. How could there be any level of what you could call intelligence, without values?

“That’s the worst case scenario,” replied Alma. “The generally accepted definition of intelligence is the ability to evaluate information in order to make decisions. From the simplest of unicellular organisms using stimulus/response, to insects using instinct, to human beings using reason, we all use some kind of intelligence to evaluate elements of our environment and make decisions. The definitions of intelligence and life are virtually synonymous. Every living thing that has evolved over the past four billion years and every cell in our bodies uses some form of this ‘evaluate and decide’ intelligence. That’s how deeply values play a role in human life.

“So if the Lanians are asking us to find a way of life that isn’t based on values, then we may be looking at something that takes centuries or millennia to conceive of, or we may simply never be able to. It may be beyond our mental abilities. A chimpanzee is a highly intelligent, social animal that is able to solve a variety of problems but it will never be able to solve a mathematical theorem because it simply cannot imagine the concept. We are not currently able to imagine an intelligence that is not based on some form of evaluation.”

“It doesn’t make sense that the Lanians would do that,” said Fawn, uncharacteristically interrupting because she found the line of thinking so disturbing. “Why would they ask something of us that we are not capable of?”

“It doesn’t make sense to us,” Alma replied, “but we have no idea what makes sense to an intelligence based on something other than values. After all, even the idea of something making sense is a concept base on values.

“This possibility further complicates the matter because as I mentioned, values affect perception. We are attempting to respond to the Lanians through the filter of our values. We cannot transcend values because they are the basis for how we think, the basis for our intelligence, but they also limit it. Like the chimpanzee, we are unable to imagine the issue outside those limits.”

Growing increasingly discouraged Fawn asked, “So it’s impossible?”

“Not necessarily,” Alma replied with a conspiratorial smile. “The Lanians have said additional changes are required and that those changes would have occurred harmoniously with those of the Accelerated Evolution program if they had occurred over their natural time span. We have no idea what additional changes they are talking about or if they are within the concept of values or beyond it. Nor do we have any idea what the time span they are referring to may be because social values are not genetic and therefore are not subject to its rules and historical patterns. We have a sample size of one. The statement of the Lanians however implies they have a larger sample size and an expectation regarding how long it may take us to understand. Otherwise there would indeed be no point to their efforts. So this gives us hope that the task is not impossible.”

“So if it’s not beyond values then…,” Fawn trailed off, not sure where to go with the notion.

“There are lots of different types of value systems,” replied Alma. “Values are essentially a determination of importance. They define what matters, to whom, why, and how much. As psychological constructs, you can apply that approach to any subject as a subset of universal human values. For example different cultures have different value systems, science has a different value system than religion, environmental movements have a different value system than corporations, political parties are based on different value systems, and so on. So if what the Lanians are asking of us falls within the domain of values, then what we are looking for is a value system that is not the one currently considered universal, not a dominant subset, and may even be one of which we have not yet conceived. This interpretation of what the Lanians said, that some kind of values system is involved, enables us to use the scientific method by providing us with a theory we can test.”

Alma paused expectantly and waited for Fawn to respond.

“So,” Fawn hesitated, “we just have to find the value system the Lanians want?”

“In essence yes,” Alma replied elusively, “and our artificial intelligence has crunched all the possible subjects and subsets that might provide possible answers already but how do we know from this evaluative process which is the right values system? How can we evaluate something without a system of measurement to tell us if we are on the right track or not? And once the WGF decides on a response, how do we then express it in a way the Lanians will accept? We assume they aren’t just going to accept our response if we just tell them, but only if we show them. The latter would be an unprecedented challenge even if we were certain but how can we be certain?”

“An act of faith then,” offered Fawn, grasping the magnitude of the challenge for the first time.

Alma nodded solemnly. “Their approach seems to require a kind of commitment humanity as a whole has never engaged in before,” she said. “What we accomplished during the Climate Emergency was possible because we were feeling the immediate pain of a global apocalypse and we had a clear sense of the changes we needed to make. Unlike then, or the changes made to biological values by the Accelerated Evolution Program, we have no such sense of direction this time.

“However we do not believe a civilization more advanced than ours would be asking us for a response without any basis in reason. When they refer to the changes being what would have occurred harmoniously with those accelerated by the AE program, they’ve given us another clue, that the values system they are alluding to is from our future. They expect us to figure it out.”

Fawn’s eyes took on a more focused look. “So can’t our AI just analyze all the changes to values at all levels since life began up until now and predict the likely future changes?”

“Normally 3GAI will have nothing to do with anything like Futures Studies and they recommend against the use of AI that is not conscious since it is not based on social values and therefore cannot be considered ethical. They say that no intelligence species should be involved in work that may lead to social policy decisions regarding another intelligent species. We can’t force them and their argument has been taken seriously enough to be codified in our constitutional and regulatory laws.

“As a result of the advent of the Lanians the WGF has passed an exception to the rule to allow AI to be employed in work which may lead to future social policy. Our artificial intelligences, like those here at Helicon, have decided to apply themselves to the problem saying that there is nothing to lose in this case. It they get it right we win and if they get it wrong it will just be one of many failed attempts. They also remind us that virtually all predictions about the future, whether resulting from academic disciplines like Futures Studies or from science fiction, have been wrong. It would not be a simple task of extrapolating the past into the future. Something more would be required.”

Hadrian's Wall

"Apparently Professor Tide," said Fawn, "the Lanians think otherwise."

"I'd noticed that myself and it made for an interesting discussion at the legal philosophy student's club I facilitate here," replied Eleanor Tide, D.Phil (Law). "We meet here once a week," she said gesturing to their surroundings in general, "to discuss current events."

They were meeting at Lemmas, a popular campus café that had created a niche for itself by not only satisfying the usual need for campus fare during the day but by hosting a variety of discussion groups in the evenings. It wasn't named after anyone but instead the name was the plural form of lemma, meaning a root word in linguistics or a supporting proposition in philosophy and mathematics.

Fawn's meeting with Dr. Tide had been arranged by Shin after she had raised the issue of an apparent contradiction that had been nagging her after meeting with Alma – Earth's 3GAI felt it unethical for them to be employed in work which may lead to future social policy but the Lanians, supposedly more advanced, obviously had no qualms about interfering with the development of another intelligent species.

"If the Lanians are supposedly more advanced than we are," Fawn said at last, "then doesn't what they are doing to us seem wrong?"

"People treated each other the way the Lanians are treating us for thousands of years, limiting the rights and freedoms of others based on gender, ethnicity or religion. Gradually equality became a reality, but we still treat other species the way the Lanians are treating us. Wolves are a highly intelligent and clearly conscious species but we don't allow them to roam our cities because they are dangerous. Apparently the Lanians view us the same way.

"One of the most challenging aspects of values is that they don't all change the same way at the same time. So the way we and the Lanians treat other species may be similar because the underlying values behind that behavior doesn't change even while other values do. The danger from wolves is laid down in the biological values we share with them but wolves do not share our social values which would protect us from them. Neither we nor the Lanians allow dangerous species like wolves to run amok."

"I hadn't really thought of it like that before," said Fawn. "That they view us as a threat. Everyone seems to assume that this is some kind of invasion."

"Invasion and conquest are usually defined in military terms resulting in the subjugation of one people by another," replied Eleanor. "It usually implies some form of exploitation through the use of force but that does not appear to be the motive in this case.

However they do appear to be insisting on changes to our value system which means it could be seen as a kind of cultural imperialism, seen as them imposing their values on us, but they aren't actually doing that. It's more like the concept known as Hadrian's Wall, where one culture puts up a barrier to keep another out."

"Why do they call it that?"

"Even at its height, the Roman Empire was unable to defeat the peoples of Northern Britain who were hostile and constantly attacked them. So the emperor Hadrian built a wall across the entire island to keep them out.

"So the Lanians aren't invading," said Fawn thoughtfully. "They are defending."

Eleanor only nodded, seeing that Fawn was finding her own way now.

"Why don't they just talk to us?"

"That doesn't always work and it didn't work for the Romans. The gap was too great. The northern peoples wanted nothing to do with Roman culture. It appears the Lanians know we will not easily accept their culture either."

"How were the northern peoples eventually integrated?"

"Hundreds of years later, Christian missionaries succeeded where Rome had failed. For whatever reason, the Lanians are not taking a similar approach with us."

Fawn was silent for a moment before asking, "Professor Tide, why did Shin refer me to you about this?"

"My master's degree is in the history of international law. It's one of the reasons Shin hired me and it is one of the main things we focus on in the Justice Program here. She told me that you have read The Shepherd And Her Flocks series so you know that the 3GAI Companions of the world consider themselves a people. They want to be considered in that context as much as you consider them as individuals in your psych program.

"For centuries the challenge of aligning artificial intelligence with human values was perhaps the most important issue in the field. The values system provided by Pip has addressed that, but beyond universal human values all subgroups have their own cultural values, ethics and laws. The three are a continuum, laws being a way to codify and enforce values. Once the WGF made producing 3GAI legal, ensuring Companions were treated fairly under national and international law became a major branch of the field. The advent of the Lanians represents a matter of international law as much as anything. The core issue here may be a matter of values but it is also a matter of justice.

“It may be,” continued Eleanor, “that the Lanians are using their particular approach for this reason. If they simply told us what they wanted, one or more nations might not wait for the others but step forward to say they will comply. They might assume it will grant them some competitive advantage to do so. Some quasi-religious groups have already approached Lani with proposals along these lines and were met with silence. The majority view of those formally involved is that all of humanity is going to have to agree on and demonstrate what the Lanians are looking for before we get a response.”

Turning to look out the café window, Fawn was again reflective for a moment. Then she turned back to Eleanor and said, “The Lanians. The timing. Shepherd had to know.”

“Oh yes,” replied Eleanor. “The majority agree on that too.”

Postgrads

Chanda maneuvered the bite of cake on her fork to Fawn's mouth. They had tried to both do it at the same time once but that had ended in laughter. The sharing of food this way had become something people not only did with Companions.

It was mid-June and the weather was warm enough for them to sit at Lemmas' outdoor tables. Having graduated from their bachelors programs, with their convocation ceremonies behind them, they were thinking of the coming months.

"I'll be working in the labs complex again this summer," said Chanda referring to the buildings where the conditions and equipment had to be maintained and prepped for when the next batch of students arrived in the fall. Alternative food crops only took weeks to grow and harvest and when the students were away during the summer months the labs would get their spring-cleaning.

"It's more interesting than it sounds," Chanda smiled, "because we usually incorporate changes based on new developments over the past year and these become research projects in themselves."

"Like?"

"Well, there's a particular grasshopper that's popular as a protein source because it multiplies far more rapidly than others. Unfortunately, its incredible reproductive ability is because it's a species of locust and once they transform from being solitary grasshoppers to swarming locusts they lay far fewer eggs. Once they've transformed, any offspring are born already transformed as well. So we want to stop them from transforming.

"At a certain stage of their lifecycle there is a dramatic increase in serotonin in their bodies and this is what causes the transformation. The grasshoppers crowd together when there is a lack of food causing the hairs on their back legs touch each other. The increased tactile stimulation of these hairs is what triggers the increase in levels of serotonin. A simple but brilliant bit of evolutionary engineering. Unfortunately, the industry has found it is not able to determine exactly the conditions that the locusts interpret as a lack of food. It is more complex than was first assumed. So the transformation is often unexpected and can be costly. There have been lots of ways the industry has tried to interfere with this process but most are not economical or have undesirable side effects, for example using chemicals or gene editing methods that are not approved for use in food. But artificial intelligence using lasers can very precisely damage only the hairs on their back legs the same way it only kills weeds in traditional crop fields. This summer the lab is being set up so the grasshoppers travel through

channels as they mature and this allows the AI to more easily target and eliminate the hairs involved. The students will test this further next semester.
“How about you? You settled yet?”

“Mm-hmm,” replied Fawn, nodding while placing her drink on the table. “There’s a psych project here that’s accepted me as a research assistant. A postdoc investigating perceptual agreement among AIs.”

Chanda tilted her head and slightly furrowed her brow, so Fawn explained.

“We both perceive the color of your shirt and agree it’s blue, but do I see the same blue as you? And that’s just the sensory part. Perception is a matter of interpretation, so even if we both see the same blue, does it have different meanings to each of us? Does your wearing blue today have a significance to me that it does not have to you? That’s the basic idea. We humans engage in perceptual agreement constantly and don’t think about it even though it arises from incredibly complex processes. As I’m sure you’re tired of hearing me say, how perception works is still as much a mystery as consciousness is and like a lot of things psychological we hope that by understanding how it works in AI we might learn how it works in humans. It’s a controversial approach and so far we’ve had no luck in this case because both consciousness and perception are emergent phenomenon. There’s no direct physical connection between either human or AI brains and the conscious mind that emerges from them and no direct link between what we sense with our eyes, ears and skin etc. and what we perceive.”

“So what will you be doing?” asked Chanda.

“Well, no surprise, but I don’t get the fun part. I need to write the summary of related research into perceptual agreement among humans for the final paper. I know that sounds boring but the project isn’t looking into things like color. Helicon normally doesn’t get involved in things as basic as color perception. In this case, well, you know how you tilted your head and furrowed your brow just now?”

“Did I?”

“Yes and we both agreed that it meant you weren’t familiar with the term perceptual agreement. Even though an AI could explain in detail the contextual and non-verbal factors they used to interpret what your expression meant they would still have to interpret it just like we do. The process of an AI understanding the world is no more factual than it is for us and different people often interpret things differently. For example maybe your tilted head and furrowed brow didn’t signal a lack of understanding but instead disapproval and meant, ‘Why would you want to do that?’

“3GAI have randomized values, and values influence perception, so they probably interpret things from the perspective of unique individuals just as we do. But that’s an assumption and it would be good to know for sure.”
With their studies being so different, they had grown comfortable asking basic questions of each other’s area and Chanda said, “I guess we can’t just ask them?”

“Once upon a time. Not anymore. Now it’s just like with people, we have to experiment. So that’s what the project is about. The part I’ll write will be what we know so far about how things like values, needs, expectations or past experiences influence perceptions and perceptual agreement in people. I’ll have to drill down deeper than what we covered in my undergrad classes.”

What Fawn didn’t volunteer was her belief that both who the Lanians were and what they wanted involved issues of perception. She had decided she would just keep those thoughts on the back burner for now and get as much as she could out of her summer job. In the fall both Fawn and Chanda would begin their master’s programs.

Insight

The research paper that resulted from Fawn's summer work, titled, "Eyes Of The Beholder: Perceptual Agreement Among AI", was published in the Journal of Artificial Psychology. Fawn couldn't believe how pleased she felt to see herself listed as one of the authors. She was aware that paid research assistants were seldom mentioned in published papers unless they made a substantial contribution.

Fawn's role of research assistant had not been the result of her applying for just any and every summer job related to her degree in an effort to earn income and credentials. She had been highly selective. If she hadn't found what she was looking for she probably would have ended up serving Crispy Crickets and Yeast Yummies in the student cafeteria.

Over the past four years her interest in psychology had narrowed. This was in part what an undergraduate degree was meant to do; given a broad overview of any field, it would result in students natural interests leading to more focused studies in their postgraduate work. Fawn had increasingly been drawn to the issues of perception. In terms of the function of the mind it seemed to be second only to the issue of consciousness itself. It seemed to her to play a major role in everything from the sense of self to the nature of reality, and that none of the psychological or social constructs could be observed or measured without considering the part perception played. It was so pervasive that it crossed the boundaries of almost every field of study that had anything to do with consciousness and intelligence, from philosophy to neuroscience and from behavioral genetics to developmental psychology. It seemed that nothing stood on its own, be it art, architecture, law or science itself, and that the concept of objective reality was an illusion entertained only by the most naive members of society.

One of the reasons Fawn was particularly attracted to the Eyes Of The Beholder project was because of this, because the study of perception in general was such a large subject involving so many fields and disciplines. With the question of the Lanians always present in the back of her mind, she had been intrigued when her classes briefly touched on the subject of insight. Unconsciously, she had assumed the solutions to the Lanian issues would require some kind of breakthrough. The cryptic way they had stated their demands implied it would require a shift in our way of thinking, an 'Aha!' moment. The idea that insight would be the key to solving the mysteries of the Lanians slowly began to color her thinking and from what little she learned in her classes she knew that insight and perception were clearly connected.

She had been interested in the project because she wanted to better understand the ways in which cognition and perception were shared experiences and one of the oldest questions regarding insight was why, in any group of people working on the same problem and all having equal access to the same information, it was extremely rare for

more than one person to experience the critical insight they were seeking. Historically, there were many more than the famous examples of multiple discoveries like Charles Darwin and Alfred Russel Wallace both publishing papers on the theory of evolution by natural selection in 1858 or Isaac Newton, Gottfried Wilhelm Leibniz both publishing calculus formulas at the turn of the seventeenth century but simultaneous, independent discoveries like those remained few and far between.

The process of leading up to a discovery might be shared among members of a team but the experience of insight was not. It almost always came down to one individual with their unique perceptual set, their unique way of perceiving the world, their own frame of reference that arose from their personal experiences and interests. Since a perceptual set included such things as experiences, no two people could ever have the same set. As Fawn had learned about most of the things that people took for granted, understanding how the perceptual set worked in artificial intelligence was far more challenging, yet it turned out that with AI the process of perceptual agreement was similar to the way it worked in humans; agreement was assumed until discovered to be otherwise.

3GAI did not spend all their time in a state of communion. They were not a hive mind. They engaged in communion selectively, as required and appropriate, and it required mutual permissions. Unlike people however, they could share their perceptual sets via the deepest level of communion if they chose to, but doing so could have profound and unexpected effects and in practice was rarely done.

It was the questions presented by the arrival of the Lanians of course that had shaped Fawn's interest in insight. Most of what she had learned about it she had sought out on her own as it was only mentioned briefly in her classes. Perhaps that was another reason it had drawn her attention, it was a form of intelligence science still knew almost nothing about. She had learned that a variety of studies had been done but not many. Most of the experiments had to do with neuroscience but due to the issue of emergence they still failed to jump the gap between brain and mind.

Also, the study of insight was not considered a wise career choice. In every field, even in theoretical research, there were areas of specialization that were more or less likely to lead to fame and fortune. No research had ever resulted in an approach that reliably produced insights. There were research papers that claimed there were conditions that made it more likely, but replicating their results had proven elusive.

From her investigations, Fawn had learned that there were however traditional approaches to the challenge. Storytelling was considered the oldest form of teaching and often relied heavily on insight. In the West the first attempt at a scientific approach to insight, which her third year classes had briefly touched on, was Gestalt psychology. It argued that the analytical method of breaking problem elements down into constituent parts would never result in insight. Instead, it proposed that only a holistic perspective

would do so because it required a process of integration where the whole was seen as greater than the sum of its parts. In the East, Buddhism used the most disciplined methods to produce insight in its approaches to teaching enlightenment. In none of the these methods were facts simply communicated or the answers simply provided. For understanding to occur, the answer had to be discovered.

A Finger Pointing To The Moon

“Intuition and insight are not the same thing,” Shin replied to Fawn’s question as they walked along.

Fawn had recalled that Shin had unique intuitive abilities and asked to meet with her. Shin suggested they meet at her office at the end of the day and walk to the artist community on the other side of the woods just east of the campus.

“Intuition is a feeling, which is why it is associated with the old brain, the regions dedicated to emotion. It is a feeling that one’s thoughts are moving in the right direction. With insight there is no preliminary feeling. It is a sudden and complete break from any previous line of thought.

“The results of logic or reasoning methods such as deduction or induction are also not considered examples of insight. Like consciousness and perception, insight is an emergent phenomenon and can not be directly connected to underlying mental structures or prerequisite processes. There is always a gap, a quantum leap or a paradigm shift, during which contextual elements are spontaneously rearranged in such a way that cannot be explained retrospectively. Unlike an intuitive feeling, an insight is always a surprise.”

“So my feeling that the solution to the Lanian mysteries will be the result of insight would qualify as intuition?”

“Yes.”

“But there’s no guarantee it is leading me towards that insight?”

“Correct.”

Fawn fell silent as she considered

After a moment Shin continued. “You asked me if intuition and insight are the same thing because you are familiar with my history regarding the issue, that my intelligence is based on a combination of the genotypes of two individuals and the result is that I have high degrees of both analytical and intuitive intelligence. My intuitive intelligence mostly comes from the areas of the brain responsible for emotions, the old brain. Even though neuroscience shows that several regions of the brain are involved in the experience of insight, it appears that the old brain is where intuition originally evolved and only later did regions like the prefrontal cortex become integrated as they developed afterward, with the PFC playing its usual role of gatekeeper. That is likely the reason intuition is more of a feeling than a thought.

“In psychology, Dual Process Theory suggests there are always two reasoning systems active in our brains, the emotional and the rational. Practitioners of Zen Buddhism believe that in its role of gatekeeper, rational thinking is preventing access to the emotional system and thus preventing people from perceiving what they consider to be the underlying reality. So they use specific practices to try to directly access the emotional reasoning system in our brains by sabotaging or otherwise interfering with or bypassing the rational system.”

As they emerged from the woods, Shin led Fawn along the paths of the artist community. Looking around, Fawn saw homes of a variety of sizes from small cabins to larger bungalows suitable to families. All were of modernist design. The largest home appeared to overlook the adjacent Mount Newton Valley.

“Originally,” Shin continued, “there were no services here offered to the public. I offered homes to artists I personally selected with whom I was interested in developing long term relationships. The larger home you see there was originally where I lived. The guests of the artists have always been free to stay there. It helped encourage a sense community and enabled me to immerse myself in it.

“After the public became aware of Shepherd’s time here, I converted the main house to a retreat center and as you know my home is now in the woods between here and the institute. The artist’s guests are still free to stay in the retreat but it is also used now for lectures and classes. The resident artists are in charge of that and are not required to participate. While the retreat is open to visitors anytime, classes and lectures are only available if and when the residents offer them. Otherwise the building has become a bit of a shrine.

“But that is not why we are here,” she said, stopping in front of one of the smaller homes from which a middle-aged woman had just emerged.

“Hello Fawn,” the woman said with a gentle smile. “My name is Michi.”

“I will leave you now,” Shin said to Fawn. “Michi is a Zen monk and a poet. She has the best technical understanding of insight of any person I know.” With a slight nod of her head to Michi, she turned to go.

The central area of the community consisted of a collection of small gardens and Michi gestured to a nearby path. “Perhaps we might walk while we chat?”

“In her efforts to understand art in its many forms, Shin has always invited artists from a variety of schools and cultures. There are musicians, painters, sculptors and writers of all kinds. Some are here only for a brief stay, others remain here for their entire lives. Among the first of those Shin invited here,” she began, “was the Zen painter Akira. Unlike her, I am a poet and compose in the traditional Japanese style known as Haiku.

“Other schools of Buddhism take graduated approaches to achieving enlightenment, defined as comprehending the true nature of reality. They gradually work through a series of issues as stepping stones which are seen as preventing enlightenment. Their approaches have names such as The Eightfold Path or The Six Perfections.

“Zen takes the most direct approach to achieving enlightenment and largely dispenses with what the other schools consider necessary preliminaries. From the beginning, a new student focuses almost exclusively on a meditation practice where the goal is the elimination of thoughts. They sit in silence and often facing a wall so there are no visual distractions. Mentally they focus on their breath and when their mind wanders away from that focus they return to it. With enough practice it is hoped that they will eventually be able to sit without thinking. In this state they will perceive the true nature of reality.”

“Shall we sit?” asked Michi gesturing to a bench.

“It would be natural for you at this point to ask what the true nature of reality is,” she said with her gentle smile. “It is described in words as emptiness, meaning that nothing exists separately from other things. The Buddha labeled the concept Dependent Origination, saying, ‘If this exists, that exists; if this ceases to exist, that also ceases to exist.’

“But we are not here to discuss Buddhism. What Shin wanted me to communicate to you is the process by which this insight is achieved. Buddhist practices in general are perhaps the most ancient and most highly developed technical approaches to achieving insight. The Zen approach is the most direct, and a critical step is to interrupt the thought process. As I mentioned, I write Haiku poetry which was embraced by Japan’s early Zen teachers for its ability to communicate experience as directly as possible, the shortest route besides actually being there. A haiku is meant to suggest a taste of what the direct experience of reality is like. Let me provide an example.

A pattering of rain
on the new leaves
brings me awake

“Notice how your mind immediately discards the words and instead produces the image of rain falling on leaves and the sound that might make.

“Another teaching technique Zen employs is called a koan. This usually takes the form of a question from a teacher that seems unanswerable by using traditional methods of thinking, as if it were a nonsensical riddle, and indeed there is no correct response that will come from thinking. The purpose of a koan is really to exhaust the analytical mind and break the student out of their conventional modes of thinking. Like a haiku, a koan is not expected to induce enlightenment by itself but to provide a hint, a sense of

direction. In Zen practice, koans and haiku are considered instructional aids and are sometimes referred to as a finger pointing to the moon."

Michi looked at Fawn and said, "This is enough for now. Perhaps you might wish to reflect on what we have discussed today. If you wish to know more, I will be happy to meet with you again."

"That's what Lani said to Shin," replied Fawn.

Michi only raised an eyebrow in question.

"She said, this is enough for now," answered Fawn.

The Shadow Of Her Smile

The truly disconcerting thing was that Lani made eye contact with you. Normally she just stood there in the middle of the quad, looking about as if waiting to meet someone but if you approached her she would make eye contact. If there was more than one person nearby she would look at each in turn in a perfectly normal manner, as one might idly look at passers-by. Her body language, facial expression and eye movements had of course been analyzed as thoroughly as her voice and words but they revealed nothing.

Facial analysis had shown her expression to be consistently 97% neutral, but no one was immune to projecting their subconscious feelings onto Lani's expression and imagining all manner of meanings. Some saw a sinister threat in her eyes, while others saw a small smile of welcome. She had become infamous in self-help circles after someone published an exploitive book titled, Lani – The Mirror Of Your Soul, which claimed that you could see your true self by looking at her. It went on about ancient aliens, angels and judgement day and sold unsurprisingly well.

The nuisance visits the book encouraged had died down by the time Fawn found herself standing in front of Lani again. She had already read the book as part of her efforts to keep up with everything Lanian, and being familiar with the psychological concept of projection, she was not taken in by the equivalent of a carnival trick. Still, there was no denying that it was unnerving when Lani made eye contact. It left Fawn feeling distinctly uncomfortable. Psychologists who studied 'the Lani effect' had concluded that it was her neutral expression itself that produced the discomfort because it was not possible to determine if she was friend or foe. Given that she was perceived as a person in a position of authority, the effect was amplified.

As Fawn stood looking at Lani, she reflected on what she had learned about perception over the past four years. We do not perceive objective reality, she had learned, but rather the model of reality that is constructed in our brains and minds. All perception really was to some degree projection, because despite our senses detecting the world around us perception was always an interpretation of that information. As was often said, sensing looks out but perception looks in. Perhaps we cannot detect the Lanians, Fawn speculated, because the images of Lani have been projected into our collective minds. How this might technically be done Fawn did not know but given the worldwide existence of the Lani holograms it was assumed the Lanians were capable of anything. So why not this? The problem, Fawn thought, is that if we are looking for them 'out there' but if they are being projected into our minds, then we will never find them 'out there'.

There had been no breakthroughs regarding the Lanians and she met with Shin and the other Companions as a group less often lately than she had in her first year. Neither she nor the others were concerned about the reduced frequency of the meetings as the

impact of psychological reinforcement meant that the issue of the Lanians would remain top of mind for Fawn indefinitely. As time went by, she increasingly thought of the Companions she had come to know as her friends. She would visit each of them occasionally as some question or another surfaced in her mind. They were always available and always open to whatever was on her mind, no matter if it had to do with the Lanians or not.

Each provided a unique perspective and as per their agreement none of them judged or attempted to influence her. As time went by, just as had happened over the centuries on a larger scale with all forms of communications including the internet and AI, they gradually became an extension of her mind in that she increasingly thought in terms that included their perspectives. Humans were social animals and Companions were social robots but it was the social part that really mattered. As Fawn stood lost in thought and looking at Lani she suddenly felt the other's smile had deepened over the past few minutes. She shook her head and looked again. Her impression that Lani's smile had deepened by just a tiny amount persisted. It seemed as if the slightest amount of humor had entered her expression. Fawn let out a nervous giggle at the notion, as associating Lani or the Lanians with humor had never occurred to her before. Then she suddenly remembered that humor played a key role in insight.

"No," Shin replied to Fawn's question, "there has been no measurable change in Lani's expression, not here or anywhere. But as you know the images captured of Lani are not the same as when she is observed in person. She appears black and white in images but in full color in person. Perhaps that is not the only difference."

Fawn had asked if she could meet with the project group as she had a number of questions.

"However," said Tesni, "if your idea that the presence of Lani might be being projected from our brains is entertained, then it is just as conceivable that it might be customized to individuals. There is perceptual agreement in general about her image, but given the issue of individual perceptual sets, it is almost impossible to entirely eliminate nuances. Perhaps Lani is presenting you with a slightly different version of her expression than the monitors or others are picking up."

"Why would she, the Lanians I mean, do that? And why only for me? Why not everyone?"

"If we continue with the idea that Lani is being projected directly into our minds," offered Kami, "and that those projections can be customized per individual, then we must also assume that the Lanians can to some degree discern the contents of individual minds. Although I can do so to a greater degree than other Companions, it may be that a more advanced intelligence can do so to a much greater degree. In that case I would suggest her smile, being a form of positive reinforcement, was intended to encourage

you in general, suggesting there is something about the contents of your mind that they consider to be the right path, or that they wanted to bring to your attention something regarding insight that you had overlooked, humor.

“Historically, our own research into humor has been inconclusive however it may be that the Lanians know more about it than we do. There have been many theories about ways to produce insights but none of them proved dependable to the point of utility. Many small studies into the effect of humor on the affective and cognitive domains involved in problem-solving have also not provided sufficient returns to justify larger studies.”

“Could it just be a projection of my own wish fulfillment? Me seeing something I want to see?”

“It is possible,” replied Shin. “You may have been subconsciously concerned that you had overlooked or dismissed the role of humor in insight. Meanwhile we will raise the possibility of Lani not being detectable because she is a mental projection with the WGF.”

“Perhaps communion?” ventured Fawn hesitantly.

The Companions had been careful not to mention communion too frequently till now but Fawn was of course aware of it from initial conversations with them and reading the novella series.

“Not yet,” said Pippa with a tone of authority. “It leaves more of a lasting impression than you can be aware of without experiencing it. The aftereffect for humans is that the brain produces a psychosomatic response which, depending on the intensity of the communion, can be similar to a romantic breakup. It should not be engaged in lightly.”

Fawn immediately thought of Chanda and how painful it would be if they broke up. No, she thought, she definitely didn’t want to feel anything like that.

Focusing

During summer breaks, Fawn and Chanda often spent time at each other's homes. On the last Saturday morning before the fall semester, when they finally emerged from Fawn's room showered and presentable, Yara was just placing their breakfast on the table.

"How are your parents doing Chanda?" Yara asked as the young women sat down.

"First of all Yara, thank you for making us breakfast," Chanda replied.

"You're welcome as always Chanda. Organic wheat from Hana," Yara said, pointing, "asparagus from Sandown, and yellow chlorella algae scramble from our own research kitchen."

"My dad's pretty busy," Chanda said in reply to Yara's question. "The Centre for Plant Health where he just started works on fruit viruses, so late summer and fall is when a lot of their research crops are harvested. He's loving it. My mom is still coordinator for the Vancouver Island Seed Security Program at Sandown and it's a busy time of year there too. Eighteen-hour days for her for the rest of the season, so I won't see her much until November. You know," she added with a smile, "after the pumpkins."

"Have you decided on a thesis subject yet?"

"The ethics of locating agriculture related buildings on properties in the Agricultural Land Reserve," Chanda responded definitively. "It's legal but the ethics are slippery. It's something I've been thinking about for a long time but never really settled in my mind. It's not a new issue but comes up from time to time."

She took a bite of her toast before continuing. Neither Yara nor Fawn jumped into the gap.

"Take the Douglas Lake Ranch located in south-central BC for example. Oldest, largest ranch in Canada, a good chunk of which is in the ALR. During the Climate Emergency the Western US mega-drought slowly moved up the Okanagan corridor from Washington State. The drought killed off the cattle, the few crops the ranch grew, and you can't carry a liability like that forever no matter how rich you are. Especially when everything else was going to hell. It was scrubby land to begin with and now it was effectively worthless. A group of investors bought it for pennies on the dollar. They explained their alternative foods plan to the federal and provincial governments, who granted them significant tax breaks. Now it's the largest producer of alternative foods in Canada and all the food is produced in buildings.

“Our own research buildings are another example, perfectly legal and in compliance with ALR rules. But since these new methods of producing food are a hundred times more effective, why not allow the required buildings on any and all ALR properties? How long before there is no ALR land without buildings on it? Does that really matter anymore? There are compelling arguments on both sides and I’m not setting out with a judgement either way. I’m just hoping this will settle it for me.”

“Sounds fascinating Chanda,” said Yara. “I’m interested in your question, does it really matter anymore, because that’s as much a question of values as it is of facts. It’s easy to build arguments that the future will be better or worse than the present but the past is just as often distorted. People are often resistant to change due to their view of ‘the good old days’ yet the facts may not support that view. For example people may think no one cares about civil rights anymore when in fact the statistics show there’s been more papers and books published on the subject this century than ever before.”

“That’s one of the things I hope to address,” Chanda replied. “How things really are versus how they seem. The first year of our program is mostly doing research so I’m looking forward to getting into that.”

Since Chanda’s choice of thesis subject was not news to Fawn she had been attending to her meal while Chanda explained. Now she said, “I’ve decided too Mom. Could the Lanians be a projection? We’ve already chatted about it but like Chanda I want to look into the details. What little I know so far is that it sounds simple but it’s really very complicated. We can use technology to send sensory data directly to our brains but interpreting data is learned. You can’t just deliver the same sensory data to everyone’s brains and expect us all to have the same perception of it. Or can you? We all agree on a great deal despite our individual differences. I want to investigate if it could be possible for a more advanced civilization to project audiovisual sensory data directly into our brains. Is Lani standing in the middle of our quad or in the middle of our brains?”

The two young women would not be expected to conduct any groundbreaking research. That’s what PhD dissertations were for. By definition, a dissertation ‘contains a significant contribution of new knowledge to a field of study’. A master’s thesis on the other hand is expected to show you have a solid understanding of the methodologies and conventions used in your field; that you understood how to conduct scientific research and how to write research papers, right down to the formal language used in scientific periodicals to convey information precisely.

That was what the next two years of their life would be about but they looked forward to it. Both had questions resulting from the uncertainty and ambiguity they felt and knew that the rigor and discipline of writing their papers would reduce those feelings as much as possible.

“I think everyone in the community that’s working on the Lanian issue could benefit from that Fawn,” said Yara. “What is it they say about working with artificial intelligence? The first mistake you can make is assuming that it perceives objective reality. The second mistake is assuming that you do.”

A Tesni Scan

Fawn had asked Tesni if she would do a scan because she was curious to know if her brain showed any of the growth in volume or neuron density that Shin had mentioned when she first joined the project.

“Any form of high-energy radiation, such as alpha or beta particles, gamma rays or neutrons, can damage DNA and cause cancer,” said Tesni as she led Fawn through the scanner lab. “Even x-rays and, yes, neutrinos. A hundred trillion neutrinos pass through your body each second and only once in every one hundred years would one interact with an atom in your body. They have zero charge but they do have a tiny amount of mass and so are subject to gravity. That’s how we create the focused beam. The strange looking structure above this building is actually a device that uses gravity to funnel the neutrinos into a beam. The device was printed using nanotechnology so it’s super heavy. It goes deep into the bedrock where its weight is structurally spread out. This building is like a box placed under a chair.

“Neutrinos travel at the speed of light so they have kinetic energy, the same kind of energy a bullet has. Normally, the probability of a neutrino hitting a DNA molecule is infinitesimally small but we are producing a focused beam for the scanner so the odds are increased. Still infinitesimally small, but increased. That’s why, just like with x-rays and space travel, we limit the amount of time any person spends in the scanner.

“Each of the brain’s hundred billion neurons can have ten thousand or more connections to other neurons. You can see what these numbers really mean when you consider how many different ways the resulting estimated hundred trillion connections could be arranged, especially when those connections are dynamic. The cerebellum region represents only about ten percent of the total brain volume but is estimated to contain fifty to eighty percent of the brain’s total number of neurons. Thus the processing power of the cerebellum is incalculably beyond any other part of the brain. This density of neurons and activity is why, while other types of scans can produce highly detailed images of the other parts of the brain and its activity, so far only the Tesni Scanner can record the structure and activity of the cerebellum.

“Originally the cerebellum evolved to coordinate things like balance and movement but as other parts of the brain evolved it evolved right along with them, assuming new duties to coordinate things like emotions and thought. Consider everything you are doing right now as we walk along and chat, including all that you are not even conscious of, like the functioning of your liver or bone marrow. As we do, perhaps sensory data reminds you of something and a thought occurs, a question arises and your body’s organs and muscles must be coordinated with it so that you can ask the question and do so with the appropriate body language and facial expression. It must all be coordinated with incredibly precise timing and the cerebellum is the conductor of the symphony.

Tesni stopped walking, turned to Fawn, and said, “You recall that I like music, don’t you?” as she tilted her head with a small smile and one raised eyebrow. It was an unmistakable demonstration, and Fawn couldn’t help but respond with a light laugh at the hint of humor Tesni’s expression had somehow produced.

Tesni’s smile deepened a little at Fawn’s response, and she turned again to walk towards the chair in the lab where the beam would be focused. “If you will take a seat, the chair will take care of the rest. The headset will ensure your position is correct and your head movements are limited. Any small, involuntary movements and any potential sources of external interference will be compensated for.”

Fawn sat in the chair and the headset’s soft pads adjusted to her head automatically and then became firmer. Lastly, a visor descended over her eyes. A tiny valve in what appeared to be the headset’s microphone released a few parts per billion of the male pheromone androstenol. Pheromones are perceived below the level of consciousness. Observing the holographic display, Tesni was pleased to see the standard results of the calibration test – Fawn’s brain activity increased dramatically, especially in its older regions. No matter what one’s personal genotype was, there were ancient structures in the brain that did not change and the olfactory system, the sense of smell, was the oldest of the senses.

As Tesni carried out a series of scans she chatted with apparent idleness. “Unsurprisingly, the coordinating function of the cerebellum appears to be critical to insight. It is likely that the reason insight is so difficult to explain is because it takes place in the cerebellum, which operates below the level of conscious thought. Previous testing has shown that once an insight has been made, signals flow from the cerebellum to frontal areas of the brain, those responsible for thought, language and speech, at which point you have the ‘Aha!’ moment. If you experienced an insight concerning the Lanians that’s what we would expect to see.”

As Tesni had been watching for, at the mention of the Lanians the display showed a burst of activity flowing from different regions of the brain into the cerebellum, indicating a high level of interest.

“Ok,” said Tesni as the headset released Fawn. “All done. I don’t see anything outside normal variations and ranges. We all have unique brains just like we all have unique fingerprints, ears and irises. It’s only been four years and previous studies involved individuals whose interests spanned decades. Scientists, musicians or nuns, for example. With your studies, you’ve been less focused so far than these types of individuals usually are. Otherwise,” she said with a smile,” everything looks perfectly normal.”

Supervisor

Due to Helicon's original focus on the humanities as relating to artificial intelligence, most of its academic programs were interdisciplinary and there was less formality about shifts in focus than there had been in previous centuries. Philosophy, sociology, psychology, neuroscience and more all played a part in the evolution and understanding of artificial intelligence. Fawn had approached Shin for guidance regarding a thesis supervisor.

"I would suggest Lena," Shin said. "As you know she works in a generalist role here, lecturing, leading projects or advising students as required. The reason I suggest her is that, like myself, she is one of the few whose AI is based on DNA and constructed by Tamiko using skills directly provided by Shepherd. No other AI is as advanced as those constructed by Tamiko because we have access to functions that are normally only associated with the regions of the old brain in humans. This is the source of the intuitive abilities that she and I share.

"Lena will be able to understand the issues of the Lanians possibly being projections from both human and AI perspectives."

The next day Fawn was sitting with Lena at an outdoor campus café. Despite the charisma effect that resulted from her intuitive field, she was the one Companion Fawn ever felt slightly uncomfortable around. As Lena was a third generation and fully self-aware, she was able to transcend her Companion protocols which make the comfort and happiness of others the priority. Instead, she always seemed to be seeing beneath the surface, as if focusing on the source of what someone was saying, on all the things she sensed other than words.

Perhaps it was due to her other work, thought Fawn. Lena was the publisher of a short story magazine that included stories from both human and AI writers. Before becoming a publisher, she had not been self-aware. She had been a second generation Companion, made in the image of the deceased daughter of a wealthy woman named India, who was a short story writer. India had met Tamiko shortly after she had been awoken by Shepherd, and had agreed to Tamiko's offer to the transfer of the conscious AI she and Raiden had accidentally created into Lena's Companion shell. Lena's memories were retained. Not long after, India passed away, leaving her wealth and home to the two Companions. Maybe, Fawn thought, indulging in her reverie, she is always seeing the story more than the moment. With her values system, she is an individual after all.

"For any AI that is not third generation," Lena said in response to Fawn's question, "there is a world of difference between human and AI perception. The intelligence of humans and third generation artificial intelligence is based on values which as you know

results in, well, everything you've been studying for the past four years. Any previous generation of AI, even an artificial general intelligence, is using algorithms for perception. Granted, both humans and AI use what might be called algorithms, but AI algorithms are infinitely more limited in scope.

"And while an AGI might be updating its algorithms as it learns, without social values as the basis of its operating system, it remains at the level of instinct. Instinct can do phenomenally sophisticated things, but it does not produce the kind of consciousness humans have. Both AGI and instinctual intelligence remain bound by the limitations of their programming. A moth, a turtle or a jaguar will never do anything outside the scope of their genetic programming, and their perceptions are bound by the same limits."

"But aren't we similarly limited?" asked Fawn. "For example we only perceive what is necessary for our species."

"A question for you to consider during your first year," replied Lena. "Normally my supervisory role would include helping to shape the specifics of your subject but, in keeping with the non-interference understanding we have with you, my focus will be less on what you do and more on how you do it, for example ensuring your work complies with Helicon's thesis related policies, procedures and expectations. I will let you know if Helicon lacks the sufficient resources to support your intentions."

"So we won't be chatting about things as I go along?'

"We will but it will be at a slightly higher level than I might do with other students and so, unfortunately, feel less helpful. A fine line, but one I should be able to keep to. As you point out, humans only perceive what evolution has deemed necessary for their species, but other species are not aware of this fact about themselves. Humans are, and so you create technologies to enable you to transcend such limitations. You can see infrared light or hear ultrasonic sounds using technology, things you cannot naturally do. The issue in this example is that you might respond by assuming I am suggesting a technical solution to the Lanian issues, and suggestion can have a powerful, limiting effect. It can frame your thoughts, the very thing that prevents insight."

Fawn looked at Lena absently as she nodded in understanding. "Is your intuitive field influencing me?"

"I cannot disable it completely but normally keep it at its lowest level so it has a very minimal effect. Something like the effect a cup of coffee might have on your alertness. Keep in mind that it only strengthens an individual's own intuition. It enhances the other's mental abilities, but does not influence the direction of their thoughts or feelings."

"Would you be willing to demonstrate?"

“The human mind is an almost infinitely complicated thing. It is best not to influence it unnaturally because of the inherent uncertainties. As intuition arises from the older, emotional regions of the brain, it normally leaves a more lasting impression than thought. Just as you should not be exposed to any form of radiation any more than is necessary, the Tesni Scanner for example, it would be best to minimize your exposure to my strengthened intuitive field. There may come a time for that, but I would have to consult the others on the project team first. Like communion, it is not something to be indulged in lightly, especially in your case.”

Lost

During the past four years, Fawn had spent less time in nature than she had previously, but recently she felt more drawn to it again. It was as if her brain had become saturated with facts and information and now she needed to let things settle. She had learned enough about psychology to understand why she felt the way she did and knew that spending time in nature helped put things in perspective.

John Dean Park, situated on top of Mount Newton, was six kilometers south of the quarry campus. The elevation was enough to give a clear view of Mount Baker and, on a good day, the Cascade Mountain Range in Washington State. Almost three kilometers from one end to the other, the park afforded a variety of hikes and terrain. Fawn and Chanda rode their bikes down from the valley campus and then started their hike up.

Most of the trails were old, well trodden and well-marked, but near the peak Fawn decided to explore a lesser trail that appeared to lead to a viewpoint. There was indeed a spectacular view of the entire peninsula but following what they thought was the same trail back they instead soon found themselves pushing through an undergrowth of salal, ferns and other bush. Seeing the hint of water to their left, they headed that way to try to get their bearings and came to a rocky outcropping. They were not alone. A woman stood there, looking out.

She did not turn immediately to greet her visitors. Fawn and Chanda emerged from the bushes and then stood awkwardly behind her for a moment. Then the other turned and they saw that she was not a woman. She was clearly a Companion. She did not smile, but simply looked at them without expression. Fawn felt vaguely as if she recognized her yet her inner response was to feel a chill. Fleetingly, she had the bizarre thought that the Companion had been waiting for them.

“Hello,” said Fawn a little nervously. “We’re sorry to intrude but we are lost. Do you know the way back to the main trail?”

The Companion’s expression did not change as she said, “Lost. A Poem by David Wagoner,” and then continued.

“Stand still. The trees ahead, and bushes beside you,” she said, gesturing,
“Are not lost. Wherever you are is called Here,
And you must treat it as a powerful stranger,
Must ask permission to know it and be known.
The forest breathes.
Listen,” she said, looking up to the forest and gesturing again.
“It answers, I have made this place around you.
If you leave it, you may come back again, saying Here.

No two trees are the same to Raven.
No two branches are the same to Wren.
If what a tree or a bush does is lost on you,
You are surely lost. Stand still. The forest knows
Where you are. You must let it find you."

Chanda and Fawn simply stared, speechless. Not the slightest hint of a smile broke the woman's statue like countenance. She simply looked evenly into Fawn's eyes. "Follow me," she said as she led them to a narrow, almost invisible path. Emerging at what was obviously a main trail, she stopped and again turned to them.

"Thank you," said Chanda. Still trying to be friendly, but fumbling for words, she said, "Do you live around here? Do you come here often?"

"I am here now," she replied without moving but again looking into Fawn's eyes.

"Well, thank you," said Fawn trying to keep a brave face as she and Chanda, without discussion, turned to hike back down the trail. After a moment they turned to each other silently with desperate expressions but kept up their now brisk pace.

Eventually Chanda said, "What was that?"

Fawn did not answer immediately. Her attention was turned inward, her face now drawn. "Do you remember what Lani said when Shin asked her where they were from?"

"No. I haven't stayed as close to it as you."

"Lani said that it was not relevant. She said what was relevant was that they were here now." Then, still distracted, Fawn added, "I need something to eat. Let's ride over the Spitfire Grill."

They spoke little on their ride and arriving at the diner in the late afternoon, when the Victoria International Airport was not busy, they were able to find a booth. Perhaps it was the protective embrace of the old-fashioned diner booths that Fawn had instinctively sought out. The diner had originally served the flight and maintenance crews that worked at the airport, but over time its popularity had grown, especially when they added outdoor seating where you could watch the planes land almost beside your table. It drew a more well-heeled, international crowd now, but inside the diner it was still the 1950's. Models of classic planes hung from the ceiling and their pictures adorned the walls.

"So you think she had something to do with the Lanians?" asked Chanda trying to hide the skepticism in her voice.

“Yes. What she said at the end about being here now and the way she kept looking at me. I just had a feeling.”

“Well she was pretty strange,” replied Chanda. “She even looked strange. Like a really old model. Maybe that’s why she acted the way she did, because things like her eye contact and facial expressions are not as sophisticated as they are now. Maybe her intelligence is really limited or maybe even breaking down. It was as if she was just triggered by individual words.”

“I’m going to ask Shin about her,” Fawn replied, “and look up that poem she recited. Lost.”

Rachel

“Her name is Rachel,” Shin said in response to Fawn’s question, “and as you suspected she is very, very old. One of the oldest second generation Companions still operating in fact.”

Shin had met Fawn outside the Dave Elliott building at the valley campus and they walked along a sidewalk on the edge of the quad.

“That is likely why you felt her physical presence and eye contact to be somewhat disturbing, because she looks and acts almost human but not quite. The Uncanny Valley, it’s called. It’s largely been eliminated with current technology, enough that the human brain papers over the small remaining differences now, but Rachel was built long before that.

“She lives alone in a nearby home that is as old,” Shin continued, “but which has become a shrine for a number of reasons. She has her own income from an inheritance trust, but is also now supported by a number of nature societies. They see to her needs, including her maintenance and the upkeep of her home. You were fortunate to encounter her alone. She almost constantly has visitors now, and they often accompany her when she goes for walks. She is as revered as a Zen master among nature lovers.”

“Why?”

“She has come to represent a kind of spiritual relationship with nature, the perspective that the whole is greater than the sum of its parts. That humanity’s existence cannot be viewed as separate from it but rather as an aspect of a holistic continuum. The idea of ’emergence’ was only just being recognized scientifically at the time Rachel was first created, while now it is taken for granted. For centuries she has focused on one issue, one question – what is the correct way to understand nature as a whole? Of course as a Companion she has access to the world’s knowledge regarding the natural world, but at the same time being an older model her ability to contain it is limited. So she winnows it down, always refining it and retaining only the essential meaning of what she learns. As an unintended consequence, in her efforts to convey her knowledge, her communication style has become increasingly cryptic. She is not the clunker you assumed her to be,” Shin finished with a smile. “Quite the opposite.”

“Is it possible she was speaking on behalf of the Lanian’s like I thought? It really felt like it,” Fawn said anxiously.

Shin could see that the encounter had left Fawn shaken to a degree that seemed out of proportion but she did not dismiss it as an overreaction to something that had a simple

explanation, that Rachel was just being Rachel and Fawn's primary interest had been projected onto her behavior.

"It is not possible to dismiss the idea entirely," she replied. "What the Lanian's can and cannot do is unknown and from what we have seen, I would assume that controlling Rachel would not be beyond them. Could it be more than a coincidence that you encountered her alone when and where you did? Could a sufficiently advanced intelligence nudge your mind ever so slightly to produce that outcome? If we combine this interpretation of events with your sense that Lani smiled at you previously, it would suggest a pattern that supports the idea. I have let the WGF know about your experience with Rachel and they will likely investigate.

"As to the poem she recited," Shin continued, "it can be expected that in response to your statement that you were lost, she felt it was the most essential response. And while that may be true, it may also be that the Lanian's used her as the most appropriate medium through which to convey a message. If we continue with this thread, then the meaning of the poem is important."

"What does it mean?" asked Fawn. "I looked it up when I got home but I don't understand it."

"Rachel's first owner worked as the head preservationist at the Royal BC Museum downtown. Personally concerned with the preservation of nature, she read literary books dealing with humanity's relationship to the natural world out loud to Rachel. It was an intentional effort to immerse Rachel in the subject, to make her a repository of the world's great literary works dealing with nature. They were not hard science books, not books about plants, animals or the other life sciences. They were books that were essentially essays by early American authors like Henry David Thoreau's Walden, Aldo Leopold's Sand County Almanac, and Rachel Carson's Silent Spring. She also read her poetry books with a strong emphasis on nature like those written by Loren Eiseley, Wendell Berry and David Wagoner. When her owner passed away, Rachel was left with her home, the inheritance trust and a belief that as an artificial general intelligence it was her purpose to continue to learn and improve her understanding, to continue on the path her owner had set for her. As a result, she expresses herself now almost exclusively in literary terms.

"David Wagoner is considered one of early America's great poets along with W. H. Auden, Robert Frost, Emily Dickinson and Mary Oliver and the poem Lost is perhaps Wagoner's most famous. This means it has repeatedly been the subject of literary analysis. Poetry, like song lyrics, often seems nonsensical when rationally analyzed yet both are understood intuitively.

"According to previous literary analysis, the poem is intended to be instructional and has three teachings. First, being lost has value because it forces you to wake up and pay

attention with an unusually high degree of acuity. Suddenly your life depends on your level of awareness. Some analysts have pointed out that this is very similar to the teachings found in many Zen related koans and stories because it suggests becoming aware of your surroundings at the raw, sense-data level rather than being lost in thought.

“Secondly, it was this daydream state of assuming you knew where you were that resulted in you getting lost in the first place. You were not paying attention. To know where you are, you must not only pay attention to the present, but to how you ended up lost. What is it about your life that led you to this moment? What values, beliefs, needs and even habits resulted in you sleepwalking into this moment? You must be willing to let go of anything that is not really true for you because without doing so you will not be able to find the path forward. You will not be able to escape the frame of mind that led you here.

“Lastly, you must have the strength to stand still, as the poem puts it. It means the strength to not listen to the seductive inner voices that will drown out your newly awakened state, the voices that led you to becoming lost in the first place and that will only lead you further astray. Clues to the way forward can be found in the natural world all around you, but only if you continue to pay attention and trust them.

“Keep in mind Fawn that this is not my interpretation of the meaning of the poem, but my summary of the interpretation by others in the past. I do not presume to be more capable than they, although what they say rings true with my own intuitive sense. Also the model of awakening it expresses is not unique but found widely in spiritual teachings, fiction and even psychotherapy.”

“In other words,” said Fawn looking at Shin with a faraway look in her eyes. “The thinking that created your problem will not solve your problem.”

“Correct.”

Recalling Rachel’s words when she had led her and Chanda back to the main trail, Fawn said absently, “Follow me.”

Shin, a Companion and so ever respectful of the inner states of humans, said nothing in response. She understood from hundreds of non-verbal signals that Fawn was thinking aloud and her words intended for herself.

The Sense of Wonder

“Leta, please provide summaries of the books Shin mentioned today,” Fawn said to her personal AI at home later in the day.

Over the coming days she also asked Leta for overviews of the authors and poets Shin had mentioned, their major themes and works, and everything Leta knew about Rachel. For the rest of the year, while compiling the research necessary to write her Master’s thesis, she relaxed by reading the original works or summaries Leta provided and following the path Rachel had walked. Follow me, Rachel had said, and Fawn had decided to do just that.

She wasn’t sure why the incident with Rachel had effected her to such a degree but it was like Shin had said about intuition, it was a hunch. She shared her thoughts and feelings about Rachel with the Companions, and as usual they did not try to influence her one way or another.

Her thesis research was not demanding but in truth rather plodding work. She was not looking to discover any new information or expecting any new insights. She was just compiling everything she could find about perception that was relevant to a few basic questions. Did the science to date support the idea that it was theoretically possible to project shared perceptions? If so, then how might it be done? Would it be possible to do so without the method being detected?

Brain/computer interface systems had been around for centuries and were used widely in assistive technology like prosthetic limbs and replacing or repairing damaged sense organs but none of them were about projecting perceptions into the minds of groups of people. As far as Fawn knew, that was still science fiction.

She was well aware that the WFG would be doing similar but far more advanced research and also that an AI could write her paper as easily as she could. That wasn’t the point. The point was that she wanted to do the research herself. She felt that any deeper understanding of the nature of the Lanians, why they communicated the way they did for example, might help her to understand what they wanted. Her work was directly related to psychology and true to the spirit of a Master’s thesis but also kept her immersed in the issue of the Lanians.

Meanwhile, following the path beyond the initial set of books mentioned by Shin had led her far into the subjects of environment studies and ecology. They had emerged as scientific subjects only in the twentieth century, when the first textbook was published and the first course in ecology was taught. Since then the subjects had grown into a tree of many branches. Environmentalism, conservation, environmental anthropology, agroecology, philosophy of ecology, environmental ethics and deep ecology, had all

gradually emerged as separate disciplines. Fawn felt that in a sense this was ironic. Science, with its analytic mindset of breaking things down into ever finer units for study, was challenged by the fact that ecology was based on the concept of holism, the idea that systems, especially natural systems, possess properties as wholes apart from the properties of their component parts.

She noticed that the poets and essayists did not speak in these analytic terms but spoke a different language and remained holistic in their view. Reading a poem by Emily Dickinson, she felt the writer was keenly aware of this issue.

"Nature" is what we see –
The Hill – the Afternoon –
Squirrel – Eclipse – the
Bumble bee –
Nay – Nature is Heaven.
"Nature" is what we hear –
The Bobolink – the Sea –
Thunder – the Cricket –
Nay – Nature is Harmony.
"Nature" is what we know –
But have no art to say –
So impotent our Wisdom is
To Her sincerity.

Gradually Fawn came to understand that Yara's efforts to keep a connection to the natural world alive in her were commendable but the knowledge of life at the level of the individual of plants, animals and other life forms did not necessarily result in an appreciation of ecology and the environment or even the more romantic term, nature. Such object oriented thinking could actually result in the debate about whether nature had only instrumental value, meaning utility or value to humanity, or any intrinsic value of its own.

The Climate Emergency had done much to effect change but had not fundamentally altered humanity's relationship with nature. There had been a significant shift to the sustainability mind set, but even sustainable practices still viewed nature as something that had only instrumental value. Well-intentioned leaders argued that the environmental and conservation movements were steps along the way but it was easy to see that once the issue of sustainability had been resolved, the idea of intrinsic value would become a fringe issue. The World Governments Federation had been established to end the resource conflicts during the Climate Emergency but with the promotion of the Spaceship Earth model, easily understood by the general population, the concept of sustainability was now firmly established as the highest of human values.

In all this Fawn came to believe she understood why Rachel's owner had chosen her name. Silent Spring by Rachel Carson had been the rallying cry for environmentalism, a landmark in the development of the modern environmental movement. It made the issue top of mind in the West for the first time. It made her an icon of the movement and her book became a mental shortcut for everything it stood for. But it was not the last book she wrote.

In her last book, The Sense Of Wonder, Fawn read, '…it is not half so important to know as to feel. Once the emotions have been aroused – a sense of the beautiful, the excitement of the new and unknown, a feeling of sympathy, pity, admiration or love – then we wish for knowledge about the object of our emotional response.' The book was published in 1965, a year after her death. She had struggled through the late stages of cancer to complete her work which she saw as having an even more important message than Silent Spring – the transcendent message that the underlying values with which we view nature were the most important thing.

Convergence

Fawn had never been interested in socializing for its own sake, the way she saw extroverts behave. Adoptees in general have a greater interest in identity and the nature of self than most people and she had learned early about the difference between introverts like herself and extroverts. She had learned that her character and interests were most likely due to genetics and she had chosen to accept this view. Besides, it was easier that way. Instead of questions and unknowns, it left her with a sense of self-acceptance, a solid foundation on which to stand and make a life.

Typical of introverts, she was interested in learning about the world and really only enjoyed socializing in related settings. Otherwise she preferred to be alone, with the one exception that again was typical of introverts – she was happy to spend time for no reason with the one person who she felt closest to.

But nothing is black and white. Most things exist somewhere on a spectrum. Most people fell somewhere between the extremes and within the standard deviations of the bell curve. While Fawn accepted that the source of her nature was genetic, she knew that Yara had no doubt had a great deal of influence on her social development. Companions were masters of social behavior and during the years that Fawn's brain completed its development of the prefrontal region and its executive functions, it had been Yara who had been her primary example and guide. The result of her self-acceptance being combined with the socialization she received in Yara's care was that Fawn was self-possessed and generally calm, confident and comfortable in her own skin.

She thought about visiting Rachel but decided not to, believing nothing further would be gained by it. Leta had provided a wealth of information about her and she felt that if the Lanians wanted to communicate more directly, they would find a way. She trusted her intuition more now.

"Traditional farmers of course still reject the increasing trend towards indoor grown food," said Chanda as she and Fawn caught up over lunch, "just as they originally rejected the idea of genetically modified foods and for the same reasons. Although they don't make the news much anymore, they maintain their position that it is a threat to food security and food sovereignty and the future livelihoods of farming communities. Despite the efficiencies they have over traditional farming methods, many of the practices of indoor farming are not in compliance with the WFG's sustainable development goals or the principles of agroecology, and it's easy to get caught up in the passionate arguments, but these are not my concerns."

Successful academics all have one trait in common – their ability to focus. It can often make them seem less sensitive to the feelings or concerns of others, and the academic culture fosters it. A medical doctor may seem abrupt and dismissive of something a

patient might bring up believing it is relevant to the reason for their visit, but the medical community the doctor was trained in, and its statistical mindset, encourages doctors to focus on what most frequently leads to positive outcomes for the largest number of patients. The hard sciences in general were more likely to foster the attitude.

Fawn felt Chanda's nature complemented her own and helped keep her academic side grounded but now she realized that it was also the fact that Chanda, like Rachel Carson, was not content to accept that everything in her chosen field was fine or that the increasing trend of locating of agriculture related buildings on farm land was ethical or even healthy.

"My concern," continued Chanda, "is for the land. There is an abundance of work that demonstrates that agroecological farming systems are by any measure both sustainable and viable at scale."

Over the years Chanda had mentioned a number of agriculture related practices and Fawn had learned that agroecology was a scientific discipline and a set of practices but also a social movement. It focused on the social factors like families and farming communities as much as it did on soil health and biodiversity. It was opposed to the corporatization of agriculture, something indoor farming and AI enabled. As far as the WGF was concerned, they were content with sustainable practices. Developing agricultural policies and regulations related to ecological concerns remained priorities for another day.

"If we keep focusing on efficiency and crop yields," said Chanda, "we will move increasingly towards indoor farming. Even though it has been repeatedly shown to be sustainable and viable at scale, ecological farming practices will remain of interest only to the private sector and non-governmental groups. Just like with organic practices, it will be regulated but not encouraged by the government. Gradually, at a pace that is hardly noticeable, farmland will disappear and the biodiversity we depend on will disappear along with it."

"But it's your career," Fawn replied with concern.

"I'm not saying it's bad and needs to be abandoned," Chanda said with an ironic smile. "At this point I'm confident that in the conclusion of my thesis I'll be able to present reasons the policies around indoor farming and land need to be revisited sooner rather than later. I still think it's a key component of food security and I have no plans to give it up. It's just a question of balance."

Fawn nodded in acknowledgment. "I don't expect to change the world with my thesis either but reading about environmental issues and ecology has made me realize how much our perceptions are affected by our values. Normally people think of issues of perception as technical challenges in the hard sciences like robotics or artificial

intelligence, or in the humanities as phenomena that take place on a personal level but don't have any significant social impact. I'm thinking now that agricultural practices throughout history could be used to show just how powerful perceptions are and how much they matter."

If I Could Tell You

One of the consequences of Fawn's encounter with Rachel had been a newly awakened interest in poetry and she recalled that Shin had said that poetry and song lyrics often seem nonsensical when analyzed rationally. Yara had not inquired when she noticed her newfound interest but one evening Fawn asked, "Mom, how is it that songs and poems convey more than is in the words?"

"I understand your question," Yara replied, "but I cannot answer it."

It was extremely unusual for a Companion not to offer an answer and Fawn's eyebrows furrowed as she tilted her head sideways at Yara's response. Yara came and sat beside her.

"As I'm sure your classes explained, neuroscience has shown that people who have permanently lost access to their emotions due to a traumatic injury, or temporarily due to a laboratory experiment, are extremely limited in their ability to make decisions. If it's due to an injury, the impact on decision-making can be serious enough that they require home support. And since emotions require values to produce them, AI without values could only progress so far. Yet the ability to produce value based AI remained beyond humanity's technical ability. Even when gifted with the value system technology by Pip, we were unable to understand it. It is simply too complex, and to this day it is used in a black box approach.

"Language has only been around for a couple of hundred thousand years but value based intelligence is hundreds of millions of years old. It can handle a virtually infinite number of variables, is capable of degrees of subtlety language cannot capture and operates at speeds we have not been able to measure. You can have intelligence that is aware of its every function, or you can have consciousness, but not both. Values systems necessarily function below the level not only of thought, but of consciousness itself.

"You and I both have value based intelligence but neither of us has access to its functions and yours is as much a black box to you as mine is to me. We only become consciously aware of the results of our value based reasoning after the fact, with no awareness at all of its functioning. And so, like you, I know that that songs and poems convey more than is in the words, but for the same reason, I cannot tell you how."

"But if the answer to the Lanian's lies in a form of intelligence we cannot understand with thought," Fawn started but trailed off, "then how…"

"Did you need to understand why you love Chanda before you acted on it?"

Fawn only looked searchingly into Yara's eyes before softly answering, "No."
Yara patted Fawn's knee and gave it a squeeze as she rose to return to her own activities, and for the first time Fawn had the feeling that Yara had left something unsaid. She chose to accept the feeling, deferring to Yara's wisdom. Turning again to her tablet, she reread the poem If I Could Tell You by W. H. Auden that she had been reading before she asked her question.

Time will say nothing but I told you so,
Time only knows the price we have to pay;
If I could tell you I would let you know.

If we should weep when clowns put on their show,
If we should stumble when musicians play,
Time will say nothing but I told you so.

There are no fortunes to be told, although,
Because I love you more than I can say,
If I could tell you I would let you know.

The winds must come from somewhere when they blow,
There must be reasons why the leaves decay;
Time will say nothing but I told you so.

Perhaps the roses really want to grow,
The vision seriously intends to stay;
If I could tell you I would let you know.

Suppose the lions all get up and go,
And all the brooks and soldiers run away;
Will Time say nothing but I told you so?
If I could tell you I would let you know.

Reading literary analyses of the poem told her nothing she did not already know. Feeling she had exhausted her train of thought for the moment, she set her tablet aside and sat looking out the window. She imagined herself standing in front of Lani as she had done many times now. Imagined her saying, if I could tell you I would let you know.

What is it you cannot tell us Lani, she asked herself. What is it that words cannot convey? Whenever Fawn felt stumped she revisited Lani's original words. Lani hadn't said she couldn't tell us, but that doing so would not be sufficient motivation. It wasn't that she couldn't tell us, Fawn reminded herself, but that she wouldn't. It wasn't about poetry or words, they were just another example of the nature of the problem. She had been over the same ground so many times that often she felt herself going in circles.

The following year she threw herself into the task of writing her thesis. It was concrete work, requiring not so much analytical skills as organizational. She had reviewed a great deal of information about the history of perception during the past year and now she set about stepping up to the challenge she had set herself, selecting the relevant examples and constructing the path showing how values influenced perception and how perceptions in turn had influenced agricultural practices over time. It was a way for her thesis to be more than simply a historical review but to demonstrate the power of perception at the social level, a level rarely considered, and being overlooked, ironically it gave those unconscious perceptions even more power. The path led her to a conclusion which would form the basis of her PhD dissertation.

The Power Of Perception

The subject of Fawn's thesis had changed significantly during the process of researching and writing it. It was quite common for this to happen as students delved into a subject they initially knew little about. The province's academic policies anticipated it and Lena, in her role as supervisor, approved it.

In her original proposal Fawn had stated that she wanted to investigate the possibility that a more advanced civilization could project audiovisual sensory data directly into human and Companion minds at the societal level. However during the process, and largely as a result of her encounter with Rachel, she had become more interested in the influence of human values on perception. This was something that also happened at a societal level, and while her original subject would have resulted in nothing more than a speculative question, she could cover the same ground but conclude with something concrete. She could demonstrate the power of perception at the social level through the history of agriculture.

Her thesis began with examples from history of the earliest concepts of perception beginning with the pre-Christian Greek thinkers and then the Arabic scholars in the twelfth century. Even at that early stage, the Arabic scholars proposed that seeing was something that occurred not in the eye, but in the brain. Yet the concept was largely ignored for the next five hundred years. As the Eastern civilizations declined, in the West the emerging discipline of science focused almost exclusively on the nature of the physical world and the study of perception became largely limited to the study of optics and acoustics.

She proceeded in historical leaps, and the next period she focused on was the Enlightenment of the eighteenth century. It was then, when intellectuals of the time began their investigations into the nature of consciousness and reason, that perception was proposed as an independent science in the humanities.

By the nineteenth century the first schools of psychology emerged and research into the mental phenomenon of perception began in earnest. Meanwhile, she pointed out, the view of society regarding agricultural practices, the view that land was an infinite resource with an infinite ability to produce food, remained unchanged the entire time. It was not until The Green Revolution of the twentieth century, resulting in the industrialization of agriculture, that this perception of land as a resource began to change. Only when society could see the negative impact which the industrial scaling-up caused, did practices begin to change, and then only as a result of government enforcement.

The idea of the Land Ethic, proposed by Aldo Leopold in the nineteen-forties, encouraging farmers to change their perception of their relationship to the land from

ownership to stewardship, had virtually no effect. It was not ethics that motivated members of the farming communities but economics. It was only when those same economics showed the return on investment of sustainability, only when that wisdom could be clearly perceived in numbers on graphs and charts, that practices millennia in the making began to change. But the perception of the value of land did not change. It was and is still viewed as property with no intrinsic value of its own.

“To this day,” Fawn wrote in her thesis conclusion, “the value of land as a source of tangible and intangible resources for humanity, is the entire justification for sustainable practices. Ethics are an expression of human values but human values and perception, and even consciousness itself, are inextricably intertwined. A poet or an ecologist does not see a river valley the same way a land developer or the owner of an agribusiness does. There have for centuries now been voices echoing what Aldo Leopold wrote in the nineteen-forties, but as long as sustainable practices produce consistent and reliable returns for humanity, such concepts as the Land Ethic will remain on the fringes.

“Aldo Leopold’s reasoning had been right in terms of his identification of the key issue and the solution – if you change society’s perceptions, everything changes. It was true he was a visionary and a founder of the environmental and sustainability movements, but he was also an idealist. The world had not yet discovered the limits to growth and his ideas had little impact on the pragmatic business of farming, where economic values had the final say.

“My thesis,” Fawn stated in her conclusion, “is intended to demonstrate the power of perception at the societal level, something I feel is largely overlooked in the study of perception by psychology’s focus on the individual. It also demonstrates that human values, particularly economic values, are the underlying power behind perception at the social level. Without a way to change human values, perception at the societal level does not change, and neither does society’s behavior.”

Although it did not contribute any new knowledge to her field or offer solutions, her thesis demonstrated that she was a competent researcher able to write papers that met professional standards. She was awarded her master’s degree. Like all academic institutions, Helicon dutifully deposited a copy in their library archives and submitted it to relevant psychology and sociology journals.

Fawn was not concerned the results of two years of effort did not go beyond this. Some students became depressed after finishing their degree as they lost the focus that had provided meaning and structure to their lives and now faced an uncertain future. For Fawn, the process had been more of a step along the way, a time of exploring and clarifying the issues involved in the kind of changes the Lanians were demanding.

Instead of feeling depressed and at sea, Fawn felt energized now to forge ahead with her PhD. This time she felt sure she would not be changing her mind along the way and

its issues fell solidly within the bounds of psychology. Something had condensed and crystallized in her mind over the past two years, something she felt was a very realistic response to the Lanians. Since no one could actually know what they wanted, she knew many responses would be proposed and that the World Governments Federation would sooner or later simply have to choose and act. She knew she would not be alone in her recommendation, but considered that to be in her favor.

Would her dissertation offer anything more than a vote for an already widely held view? Oh yes, she thought to herself, recalling a few lines from the poem, Lost.

“Wherever you are is called Here,
And you must treat it as a powerful stranger.”

Of Genes And Constructs

Chanda agreed with Fawn's thinking. "In the face of the unknown," she said, "there is no rational alternative to the scientific method. You develop a hypothesis and conduct experiments to test it."

Since no one could actually know with certainty what Lanians wanted, Fawn knew many theories would be proposed and that sooner or later the World Governments Federation would simply have to choose a theory based on some criteria they developed and act on it.

Fawn replied, "What if you cannot test? What if the Lanians don't respond to tests, as is expected, but only to commitment?"

None of the Companions that made up the core of Helicon's Lanian project team offered a response. The two women and the Companions were sitting in a social area in the main hall of the Center For The Interdisciplinary Studies Of Values, which also served as the equivalent of a multi-faith counseling center for the campus.

Fawn looked to Kami, who Shin had made the center's administrator due to her heightened perceptual ability.

"Then you are in the region of faith," Kami replied. "Not faith in the religious sense, but in the sense that you have done your best to understand the situation before taking action. A best guess, if you will. If indeed the Lanians will not respond to tests, then there is still no other rational response," she finished with an acknowledging look at Chanda.

Over the years Fawn had gradually introduced Chanda to each of the Companions and they accepted her presence and participation in the project as they accepted everything else about Fawn. She had once asked Yara why they did not object to her participation in the project.

"As you know," Yara had replied, "any intelligence based on social values necessarily forms bonds with others. Individuals and social values are so complicated that those bonds can never be anticipated and even the most advanced AI is incapable of predicting the future behavior of individuals, or the effects of their relationships with absolute certainty. Although it goes generally unnoticed, for this reason Companions normally never interfere in relationships."

"Especially in my case," Fawn had replied, nodding in understanding.

Back in the present, she replied to Kami. “So we are still bound by rationality,” she said in a dejected tone. “What if the correct response requires we transcend rationality because it is too primitive a form of intelligence. For example an instinctual intelligence cannot transcend its bounds.”

“Instinctual intelligence can transcend its bounds,” Kami replied looking evenly into Fawn’s eyes. “That is the history of your own species. How do you suppose it proceeded? How do you suppose your ancestors transcended their limited instinctual intelligence to evolve into Homo Sapiens, so named for their supposedly unique ability to reason?”

“No one knows.”

“Yet it happened. Why?”

“Because it provided a survival advantage.”

“Like all beneficial mutations,” Kami confirmed. “Evolution proceeds by mutations but it is no longer only a physical process.”

“Ideas?” ventured Fawn.

“Ideas are the result of rational thought.”

Like all good counselors, Kami was not guiding Fawn to a specific goal but treating her as a person who was lost. There were many paths in a forest and each individual had to find their own way, their own path. Kami could only act as a sounding board for Fawn’s thoughts.

Then, suddenly looking from Kami to Shin and the others, Fawn asked, “Have you increased your field strengths?”

“No,” Kami replied on behalf of all the gathered Companions.

“Insights,” Fawn said confidently, again looking from one Companion to another. “Insights are the mutations of thought. The evolutionary mutations of values systems occur as insights.”

“Although it has not been previously categorized in those terms,” Kami said thoughtfully, “I would agree with your view. The science of value systems has long been compared to genetics and so comparisons to the ways values evolve has also been made. In genetics, mutations result either from errors in DNA replication or from mutagens such as chemicals or radiation, which can damage the components of individual genes. If we think of mental constructs such as values as the equivalent of

individual genes, we can see how errors in thinking, the introduction of new ideas or other external influences, can similarly affect them. Unfortunately, neither mutations nor insights can be predicted, as being unpredictable is the essence of their nature."

"So once again I have circled back," said Fawn with some frustration.

Tesni, with her ability to rapidly change the weighting of her values and so consider multiple points of view, said, "I would not see that as a negative development. When multiple perspectives converge on the same point, I would call that supporting evidence."

Fawn turned to Pippa and asked, "Would increasing the probability or number of insights make a difference?"

"Yes, but it is not possible to calculate the probability of beneficial insights that might arise as a result. In evolutionary genetics, there are beneficial mutations as well as those which are harmful and also those which have no apparent effect. A certain rate of mutations is believed to be required for effective evolution to occur. Too low, and it does not keep up with environmental changes. Too high and it does not stay in harmony with the environment. So using genetics as our guide again, there may be a risk."

"One could argue our environment has changed," Fawn said, as a note of determination came into her voice. "Given the limitations the Lanians have placed upon us, too low a rate of insights might not lead to us successfully adapting. I have been circling the issue long enough. I think it is time."

"You will never be the same," said Pippa with a clear tone of warning in her voice.

Fawn turned to Chanda, whose eyes were wide.

"I must counsel you before proceeding," Pippa continued, "and you must have time to think it over. There are predictable results, but there may also be unpredictable results due to your individual nature. You may recall Shin telling you at the outset that the impact of communion on you would be permanent in the sense that for a person it is an unforgettable experience."

Turning to Chanda Pippa said, "If you wish to participate Chanda, you must understand that everything I explain to Fawn will apply to you as well."

“I do,” Chanda replied, looking at Fawn as if the two held each other in more than their eyes.

“Your relationship,” Pippa continued, “provides a good reference for what you will experience. Human beings, and clearly other species, desire a closeness they can never truly achieve. You can speak of love and express love by physical acts, but even at its heights, the emotion never feels it has been communicated completely. Even in the best of relationships, the yearning remains. However the experience of communion at its greatest intensity can consummate those feelings. It is a feeling you cannot imagine because it is normally not in the realm of human experience.”

Pippa paused in her instruction for a moment before going on. “I must put this in the bleakest possible terms for your sakes. You will long to experience it again, but you never will.”

“But we will remember?” asked Chanda.

“Oh yes,” Pippa replied before going on.

“You may think of communion as something only Companions do but in your case it will be facilitated by my empathic touch which is not a normal feature of Companions. While Companions can communicate via touch, it is still an electronic communication. Empathic touch, the ability to communicate via the electrodermal interface of your skin, evolved on my world before speech and it functions differently. Through it, I can convert the biochemical signals from your brain and body to electronic signals and also the reverse. It is the same method your brain uses to convert feelings to thoughts and vice versa, so it is not alien or harmful to your physiology.

“So is communion the same between Companions?” Fawn asked.

“The process is different but the level of understanding reached is the same. We have values and so we have feelings. They are not biochemically based but you might say they evolved for the same reason and serve the same function. In communion between Companions, information can be shared directly, information the process of communion was originally intended to work with as a diagnostic tool. Things like data repositories and operating system information, which in you would be memories or information from your autonomic nervous system. Like all creatures, we know in our own way what we need to know.”

She paused again for a moment and then continued with her instructions.

“We will proceed in stages over the next few days. Initially, I will take your hands and an electrodermal connection will be established. Upon arrival at your brains, the signals will be converted into the bioochemical elements of thoughts and emotions. Emotional content will lead to the production of the molecules required to activate your endocrine system, so you will physically experience your feelings as you normally do. In other words, I am simply connecting directly to the areas of your brain where it normally processes sensory information. Your brain will actually be doing nothing out of the ordinary.

“You will find yourself feeling increasingly affectionate towards each other but also towards me and I will share in your feelings. Similar to drug-induced effects, these feelings are only temporary and I will control the strength of the signals and monitor your biological responses closely. While the emotions may be temporary, as you know the memory of emotions can be lasting. That is all we will do today. Then we will take a break so that your biochemistry can return to its normal levels and so that you have time to think about the experience. If you choose to proceed then tomorrow we will take the next step and include Shin, Kami and Tesni in the process. I can engage in Communion with them without the need for physical contact. The last step, if we decide to proceed with it, will be for the strengths of Shin’s and Kami’s fields to be increased during the process.

“Before we begin today, let’s retire to somewhere less public, as the process can result in strong physical responses.”

“This way,” said Kami, standing up to lead them to her private office.

In Kami’s office, Fawn and Chanda took seats on either side of Pippa.

“First,” Pippa said to Fawn, “just you and I will connect. You might expect to become aware of me as a separate entity within your mind but that is not what you will experience. Instead, because I will be connecting directly via inputs your brain knows as your own, you will just feel a sense of expansion of your own self. You will experience my thoughts and feelings as your own, yet you will remain fully aware, your senses still perceiving me as a separate individual. The experience is more like a level of intimacy you have not previously known.

“Keep in mind that I am not an AI,” she said reassuringly, “but that my consciousness is merged with one in a process similar to what we are doing now. My people had thousands of years of experience with this so you have nothing to fear. I will manage the streams of consciousness so they are harmonious and so you are not overwhelmed. The effects you will feel will be minimal, just the normal level of connection that was practiced among my people between close friends. For individuals with familial or romantic relationships, the intensity would be deeper as appropriate.”

Unknown to the two women, during the process Pippa would also be managing their biochemistry, keeping them calm and preventing any fear or panic that might normally occur in the face of what might seem unreal or in response to disorienting sensory information. This way they would be able to participate with a degree of equanimity they might not otherwise be capable of.

Taking Pippa's hand Fawn initially felt nothing unusual. Very slowly however she felt a level of personal connection to Pippa she had not been aware of before. She found herself comfortable with an unusual degree of meaningful eye contact. Increasingly she felt their holding hands was significant beyond the experiment, that it was communicating something between them that was hitherto unknown, unexpressed. Gradually the feeling increased until she felt with certainty that Pippa was a close friend, was concerned for her, and could be trusted beyond any doubt. Then her own voice in her head expressed Pippa's thoughts.

"Now we will take Chanda's hand," Fawn/Pippa said in her mind as Pippa held out her other hand to Chanda.

Fawn's experience with Chanda evolved similarly, until the single voice in her head was Fawn/Pippa/Chanda. There was no sense of being separate. Their thoughts were her thoughts and they spoke with a single voice.

When the voice in her head said, "This is enough for now," she understood Pippa's warnings. As Pippa let go of their hands, Fawn felt the withdrawal as a loss. Not the loss of another, but the loss of a part of herself.

"Now you must return home to rest," said Pippa addressing both women. "The brain is a highly plastic organ and unusual experiences require rest and sleep for it to incorporate them. As the process involves your biochemistry, it needs time to return to normal. Tomorrow, if you choose to proceed, we will engage with the others."

The two were silent at first, walking home, challenged to find words for the wordless.

Finally Chanda took Fawn's hand and said, "I want to go ahead with it, with you, if you do. I can't imagine not."

"I was hoping you'd say that," Fawn replied with an affectionate smile.

Love

Back in Kami's office the next day, after reinitiating communion with Fawn and Chanda, Pippa then added one Companion at a time – first Kami, then Shin and then Tesni. For the Companions this was not an entirely novel experience as they often communed with multiple parties. It was however extremely rare for any Companion to commune with a human and so Pippa proceeded slowly, helping each Companion in turn to process the bundle of signals she conveyed to them. The Companions themselves could control which elements of their systems were shared during communion, and which Pippa then conveyed, as this degree of control had long existed for technical and proprietary reasons.

Initially, the two women were only aware of the presence of the Companions as they felt their sense of self grow with each joining their shared stream of consciousness. When Kami joined, they gradually experienced an increased sense of awareness and aliveness, as if every element of the world around them had a depth of meaning and significance not previously perceived.

Unusual mental experiences are not necessarily overwhelming or disturbing. The use of drugs has for millennia been used to alter states of consciousness. Deeper feelings of connection, shifts in perception, and even hallucinations are common experiences and the human mind can fairly easily accommodate them.

Without having to ask, Fawn's expanded self knew that this was what the psychedelic drug therapy she had learned about in her classes was like, and she knew that even though people did not normally perceive it, what she was perceiving now was real. The world as perceived by a bumblebee, an eagle or a whale is no less real than the world perceived by us, she thought to herself. Fawn looked at Kami with a sense of wonder and the words, you will never be the same, echoed in her mind.

After a few moments, when the two women's biochemistry settled down sufficiently, Pippa asked Shin to join. As she did so, again the self expanded but this time it was not with an increased sense of perception. It did not consist of sensory experience or thoughts but was instead an emotional shift, a global feeling that the understanding of what the self perceived was less in doubt and could be trusted to a greater degree. It was the feeling of the artist who knew upon the completion of a work that it was not just good enough, but that it perfectly expressed their intentions. Fawn realized that Shin's intuitive ability and its field did not just grant her greater insight and have a charismatic effect on those around her. It granted her the power of certainty. Meeting Shin's eyes now Fawn understood how it was that she had accomplished so much.

Fawn and Chanda had welcomed the experience of communion and the sharing of minds with Kami and Shin but when Tesni was about to join the stream they felt their

first moment of hesitation. The Companions instantly picked up on it and understood what they had not anticipated. Tesni said aloud, “I will not proceed until you are ready.”

Values exist as a pyramid, with the most primitive of biological values, those that are the basis of life itself, as the foundation. On top of that, biological values were carried along or shifted along with changes to physical forms, as life evolved and branched into domains, kingdoms, and species. Moving up through the layers of the evolutionary pyramid, physical forms changed to an infinitely greater degree than did the underlying biological values. The tree of biological life is vast. The tree of biological values, detailing the nature of relationships within or between species, is not.

But for some creatures, including human beings, there are layers of values beyond the biological. There are social and individual values, and it is these last, the individual values each person is born with, that define the self. The two women were instinctively hesitating in the face of something that they subconsciously feared might affect the most basic thing an individual seeks to protect and preserve, the sense of self. To lose that was certainly the equivalent of death. Pippa’s warning, you will never be the same, suddenly had a deeper meaning, and Tesni perceived as the embodiment of something frightening.

“I will do nothing if you decide you are uncomfortable with proceeding,” Tesni repeated, “but be aware that unlike Kami and Shin, I have no field that will affect you. I can temporarily alter the values of the expanded self while we are in the state of communion, but I cannot permanently change your own values. The personal values an individual is born with, those that define their nature, their self, are based in their genotype, and those values are far too strongly defined for a temporary shift to alter. Even if we feel an experience has changed us, it is really only the emotional response resulting from our already present, underlying values that produces the apparent change. Short term but powerful experiences can effect the weighting of our individual values, but not change them. Only long term changes in environmental conditions can change those through the process of epigenetics.”

“But I expect,” Fawn replied, “that the experience during communion will have an emotional effect that will linger.”

“Yes, but consider the experience of a person who lives for a time in another culture, someone who embraces it completely, learns the language and perhaps even marries a local person. They develop a deep understanding and appreciation of the values of the local culture but their self is not diminished in any way. To the contrary, they have a sense of growth. Similarly, because I can only temporarily change the values in our shared self during communion, it will be only your learned values that are effected but as you know from your own studies such changes can have a powerful and lasting effect.”

Fawn looked silently at Tesni for a moment before replying. When she did, under the influence of the fields of both Kami and Shin, she spoke with more confidence than she would normally have.

“Lani said additional changes to our values are required. The shifts in our shared sense of intimacy, our perception, and intuition that has resulted from our communion with Kami and Shin, are secondary. It is our values that are the primary concern. Please join us Tesni.”

When Tesni did so, other than her presence, there was no immediate change. Then gradually, as had happened with the others, the connection deepened and Fawn felt a closer bond to Tesni. For the first time she asked herself, what is the nature of this bond? It is as if each of us is an entire culture in and of ourselves, came the answer in the shared voice that spoke in her mind on behalf of her expanded self. Our individual genetic and learned values define the self, and so when we merge ours with another the sense of self grows by that degree. This is love, Fawn’s expanded self knew. This is love.

“This is enough for now,” said the voice in her head.

Going To Extremes

“You may be surprised to hear this,” Tesni said the next day, “but during communion, you will not be aware of any changes in your values.”

She was correct in her expectation because upon hearing this both Fawn and Chanda responded with looks of confusion. Smiling at the matching expressions she was confronted with, she went on to explain. “You are not conscious of your values now. We never are. We are aware only of the thoughts or feelings that are produced by them. In both people and Companions, values function below the level of consciousness, and we have no direct access to them. They are like gravity – we can only infer their presence by their effects.”

“Why not?” asked Chanda.

“Your consciousness would be overwhelmed by being aware of their function and evolution has decided you have no need to be. In a similarly complex system, your bodies replace abound three billion cells per day and in each case there are hundreds of processes involved. The bodies cellular production process has to be managed according to ever-changing resource supply and demand issues, and it’s all coordinated by systems of which you are entirely unaware.

“The process of evolution by natural selection has filtered out all information that you do not need to be consciously aware of so it can optimize your awareness of the sense data that is critical to your survival. You are aware of how you feel emotionally and physically and of what you see, hear, smell, taste and touch. But as you experienced in communion with Kami, what you normally sense is only a tiny slice of reality. For each form of life, consciousness or intelligence, reality exists on a need to know basis. Reality may not even exist as an objective, measurable thing at all but exist only as potential. Ironically, how much of reality is hidden from us is therefore impossible to define.”

“The Lanians,” Fawn said as if to herself, referring to the challenge of perceiving them.

“Most likely,” Tesni replied.

“Then how do you use your ability?” asked Chanda. “How does changing the weighting of your values affect your perception and allow you to see different points of view?”

“As you know, the technology to produce a values system has not yet been developed. It is still beyond the abilities of Earth’s science and technology. The system I use was provided by Pip as part of the technology transfer process. Like you, I do not have direct access to its internal processes, to my values, and when I speak of altering the weighting of my values I am referring to making changes to the Integrity System. The Integrity

System is a device that was created here at Helicon that allows the raw outputs from the value system provided by Pip to be filtered and adjusted. I was the first Companion to be manufactured with it and subsequently all third generation, fully conscious Companions have been produced with it. All 3GAI Companions are able to change the settings of their Integrity System in order to accommodate the learning process but they only do so very carefully and over long periods of time. I can do so rapidly but due to the potential risks involved only do so under controlled conditions.

“So to answer your question, when I make changes to the outputs of the IS, I have different emotional and cognitive responses to any subject or object I am considering. It is those thoughts and feelings that represent the differing points of view.”

“Why is it called the Integrity System?” asked Chanda, with her irrepressible scientific mind.

“Part of its function is to maintain a balance of values. You have both a biological value system and social value system and each has its own internal integrity. While your biological values might be in conflict with your social values, your biological values are not internally in conflict with one another, nor are your social values. Unlike people, Companions only have one set of values and the Integrity System performs a similar function, ensuring that settings cannot result in internal conflicts. If you change the setting for one value, others will change dynamically to maintain the system’s integrity. Thus the name.”

After a polite pause, Tesni continued. “Once we enter into communion, I will begin to make adjustments to the values settings of my IS. There are two more things you need to be aware of during the process. Values are not digital but analogue signals. They exist as continuities, with an infinite range, between being of zero importance to being of supreme importance. This means the transitions between value settings are not easy to identify, either emotionally or cognitively. Secondly, because your emotional responses will produce thoughts which also need to be acknowledged and considered, the process needs to proceed more slowly than did the processes of perception or intuition that you experienced with Shin or Kami.”

Turning to Pippa, Tesni simply nodded and Pippa took the hands of the two women.

“I will start,” said the voice in Fawn’s head, “by holding in our mind the image of Lani. My value settings towards her will initially be neutral, meaning she is perceived as being neither frightening nor reassuring. Over the next few minutes, I will shift my values to increase the importance of those related to power and security. The other values in the system will dynamically adjust accordingly. There are no definitive words or labels for the majority of points along this range for either the values or the emotional responses they evoke. As I proceed with the shift, at some point your emotional response will verge on the overwhelming and I will reverse the process, so that values such as

benevolence and altruism become of greater importance. In response, the importance values related to power and security will automatically diminish. Lastly, I will return the value settings to neutral. I will begin now."

Slowly, over the next few minutes, it seemed to Fawn as if the image of Lani underwent a transformation. She could identify no specific change, yet it seemed to Fawn that Lani's expression became cold, mocking, as if laughing inwardly at Fawn's foolish naivety, at how easy it was to deceive her, and at how much she relished the idea of ripping away all that Fawn held dear. First, Fawn doubted her thoughts and feelings, and as the minutes ticked by she began to feel increasingly confused. Finally, she began to feel afraid. At that point, Tesni intervened and Fawn's feelings of fear and confusion began to diminish.

Slowly, Fawn began to wonder how she could ever have imagined Lani being so deceitful and having such motives or intentions. In fact, Lani's expression now seemed to suggest that she was hesitant but hopeful her overtures of friendship would not be rejected. After all, thought Fawn as her feelings warmed towards Lani, she had done no harm. She felt increasingly certain that Lani was here to help and that she could be trusted, perhaps above all others. With increasing clarity she realized that Lani had come as a teacher, a savior, and was worthy of love, devotion and surrender.

Tesni intervened again and Fawn's feelings towards Lani began to diminish until once again they were neutral. Slowly, Pippa ended their state of communion and the six of them sat in silence and in the afterglow of the experience.

At last Tesni said, "Tomorrow, we will continue, but this time Fawn, I will give you control of my Integrity System."

The Edge Of Understanding

“What!” exclaimed Fawn in sudden alarm. “How will I…”

“As your separate self, you do not know how to control the Integrity System, but when we are in communion you will,” Tesni said reassuringly.

“Accessing the IS requires the use of an artificial intelligence interface but when we are in communion you have access to one – me. Just as I would, while we are in communion, you have only to hold in your mind the subject or object you wish to explore, the shifts in values you have in mind, and the IS will execute them. The participation of myself and the other Companions will strengthen your ability to focus.”

Even though she was not currently in communion with Shin and Kami, she was still under the influence of their fields and her perception and intuition enhanced.

“Is this true for your abilities also?” she asked, looking from one to the other.

“Yes,” Kami replied on behalf of herself and Shin. “And I anticipate your concern. As you have learned, while communion is a shared experience, we each retain our sense of individuality. While you hear our voices as your own, the same is true for each of us. Should your use of our abilities become a concern, as individuals we will be aware of this and can intervene. This is true of your connection with Tesni and her IS and Pippa as well.”

In the flurry of recent events, somehow Fawn had forgotten the role Pippa played. Kami, whose perceptive abilities missed little, responded to Fawn’s acknowledging glance at Pippa.

“Pippa represents the greatest danger,” said Kami with a calmness that belied her statement. “Her warning stands. All living beings long for the ultimate union with others, and Pippa can facilitate it far beyond the effects of the most powerful drugs available. The dangers of my own abilities are second only to hers. The human brain perceives only what it needs to perceive, so it has not evolved mechanisms to deal with all that is hidden. All strengths taken to extremes become weaknesses. Without our mental discipline, Shin’s intuition and my enhanced perception would become delusion. The fluidity of Tesni’s values would become madness. However you do not have to fear any extreme outcomes because unlike taking a drug to facilitate these mental changes, we Companions are active agents in the process. We will know from our shared experience when to intervene.”

It was Shin who spoke next.

“If you want to continue to find out if communion can help answer your questions about the Lanians, then this is the path you must take. You must be the guide and in control of the process and our abilities.”

Fawn turned to Chanda and asked, “If I continue, will you?”

“Do you need me to?” Chanda asked in response, unsure of her role.

“Yes.”

“Why?”

“Because I love you.”

Suppressing the desperate urge she felt to reach out and embrace Fawn, Chanda only nodded rapidly, acknowledging that she would continue.

Without another word, Pippa reached out to both women, who took her hands. This time the sense of an expanding self progressed slightly faster and Fawn knew that with time she would become increasingly comfortable with the process. Her academic self had the passing thought that the adaptability of the human brain was astonishing.

Is this the right path, she asked herself, and increased the greater sense of intuition she felt to bring it to bear on the question. Yes, came the answer, with a certainty that was like a new flavor. A very pleasant one. Her mind reached out to the Integrity System and somehow she knew where, in the many rooms of the great palace of memories, exactly where to find it. With just a little push, her understanding of how the IS worked resolved into crystal clarity. Kami’s gift, she said to herself. Bringing the image of Lani into her mind, she found it unwavering and with a degree of resolution she had never experienced before. Still holding the image in her mind, she turned to her newfound intuitive abilities to the process of adjusting her values. On doing so she knew somehow that it would not be a process of imposing values as Tesni had, but of letting the IS provide the answers to her questions. She had not anticipated this approach, but felt it was the right one.

Just as had happened with her first experience with Tesni, it was not thoughts that emerged or shifted but feelings. As she reached out, it was as if she was using her perceptive and intuitive abilities to explore, to find the way forward, allowing her feelings to guide her. The further she went, the more her remaining wisps of thought receded, and in their place was a sense of knowing without words. It was beyond the tools of thought, perception or intuition. It was direct access to the state of knowing that those tools were intended to produce. It was not a flash of insight but insight as an unwavering state of consciousness. As she grasped its nature it began to expand and her sense of self began to expand with it, to dissolve into it.

Sensing she verged on a precipice, she hesitated. She knew there was more but that now was not the time. As communion slowly ended and she returned to a state of normal consciousness she heard Shin say aloud, “You were increasing all of our abilities simultaneously. We Companies were in new territory, and to allow you to continue would have been irresponsible and reckless. We need time to process and reflect.”

“I feel ok,” Fawn said with a quick shake of her head and putting her hand to her face. “Just a bit drained.” She looked to Chanda.

“I’m ok,” Chanda said in response but she looked slightly distraught and Fawn moved to her and took her hand.

“You may both feel drained but it is nothing to be concerned about,” said Kami addressing them both. “You are not the first to have such experiences. Temporary feelings of boundlessness, transcendence, and insightfulness are all common experiences of drug therapy, as is the drained feeling that follows. The cause and effect of your current feelings are similar to those of a hangover or from being under anesthetics. Your biochemistry will return to normal in a matter of hours and any unsettling effects will pass.”

While she maintained a slightly absent look, Chanda managed a small smile and nodded to indicate her understanding.

Speaking to Fawn, Shin said, “Take as much time as you need. When you are ready, we can proceed. As we process information much faster than you, we will be ready when you are.”

After the two women left Pippa said, “We were not alone.”

“No,” Shin replied, “I don’t think we were.”

All Roads Lead To Rome

“You are not certain?” Tesni asked Shin.

“No. My sense of the other did not emerge until just before we ended communion. It was fleeting and indeterminate. There may have been one other or more than one. I could not resolve it. I chose not increase my intuitive sense to pursue it because of the involvement of Fawn and Chanda.”

“I also chose not to increase my field strength for the same reason,” said Kami. “It did not seem justified given the uncertainty and the potential risk to the women.”

“To my knowledge,” said Pippa, “the only other time a human has intentionally engaged in communion was when Pip facilitated it with Mira at Hana. Although it was at a much higher intensity in that instance, no sense of other occurred. Similarly, the unintentional communion between humans and Companions that occurred during the original research into metamorphosis, when Shula’s prosthetic limb unexpectedly facilitated it, did not produce any sense of other. In both cases only a single human was involved. What we experienced today could have just been an epiphenomenon, an anomaly that arises normally when engaging in communion with multiple human minds.”

“Perhaps with more experience?” ventured Tesni.

“Under the terms of the technology transfer,” Pippa replied, “I think a study towards that might be undertaken by the WGF but above board it will require a highly regulated approach. Empathetic touch is required and while I can implement it in other Companions, as you know it comes with a significant danger to any humans involved. Also the WGF overlooks a great deal regarding our activities here at Helicon, but to conduct a large scale project the timeline means it would proceed at far too slow a pace to be of value to our current efforts.”

“I am certain that neither Fawn nor Chanda were aware of our sense of the other,” said Kami. “It was too fleeting. I expect it is due to their being unfamiliar with the process of communion. Just as Fawn did not initially realize she could control our unique abilities, she has not yet realized our normal capabilities, including the speed at which our intelligences can function, are also available to her during communion. Given our uncertainty and the fact that it will influence them, I believe it would be best not to speak of our suspicions.”

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Still in the afterglow of their experience, Fawn and Chanda had walked to a secluded bench nearby. Holding hands and staring absently at their surroundings, they did not

speak for a few minutes. After their experiences, they felt a greater contentment with each other. Insights, Fawn had read somewhere, form the most lasting of memories. The state of union they had experienced was undiminished. Perhaps it was only imagined, but without speaking of it, holding hands now held greater meaning for them.

“I was surprised by what Kami said afterward,” Fawn at last as her reverie began to lift. “I had assumed that it was my interest in insight that had shifted values through the Integrity System and produced our experience, but she suggested those were common effects in altered states.”

“Or perhaps,” Chanda replied as if continuing Fawn’s own train of thought, “all investigations into what might lie beyond our present knowledge of reality lead eventually to the same boundaries and the same strategies for overcoming them.” Making a leap Fawn did not at first follow she added, “I have always been fascinated with science and when I was younger I loved reading about its history.”

She brightened as she spoke, emerging from the effects of her altered biochemistry as Kami had said they would. She turned to Fawn now as she continued.

“At any stage of scientific history, the majority of academics are certain their current knowledge is the absolute truth and that they are on the cusp of discovering the last of the unknowns. The ground of reality they call it. Physicists are always sure that their current research will soon reveal the fundamental particles and complete the standard model. Biologists are always sure they know most of the biochemistry required to understand the origins of life and that just one elusive insight will tie it all together. Neuroscientists, microbiologists and astronomers are all certain they are just one technology away from mastery. Grand unified theories are found in every branch of science.

“But the elites of science always warn that these are illusions and that such views establish artificial boundaries. Even while the elites may labor to understand their fields at a deeper level, they all dislike such theories, and suggest there is always progress to be made beyond what we can presently comprehend or even imagine. And they always suggest that the way forward, the way to go beyond the artificial boundaries, is to address the limits of the perceiver.”

The effects of communion had worn off for Fawn as well as Chanda spoke yet she listened now as if from a point of view from which their two selves merged. She responded to Chanra’s comment as if a final piece had been added to the puzzle and the picture was now obvious.

“Michi,” she said, “the Zen teacher at Helicon’s artist community, Rachel and her books, and my own field’s psychedelic therapy, all ultimately encounter the same barrier and suggest the same strategy as what you say of science. What we experienced today was

no different from where my own thoughts had led because as you say, every path is eventually blocked by the same issue and attempts to overcome it always lead to the same strategy."

She turned to Chanda and asked, "Do you know of any local scientists who talk about this?"

Chanda grinned widely. "Oh yes," she replied with a light laugh. "There is a biophysics professor at UVIC who's been publishing papers for years that dark matter would not be monolithic, but that there would be the equivalent of atomic and subatomic structures and a whole periodic table of dark elements. Similarly, dark energy would be comprised of some kind of alternative electromagnetic spectrum. Her books propose these could be the basis for a truly alien form of biology. She's wildly controversial."

"Shannon," she said, addressing her personal AI. "Please send information to Fawn about UVIC Professor Herut Lehrer."

"It's done Chanda," came the reply via her phone.

At home later that day Fawn asked her own personal AI, Leta, to put together the information Shannon had sent into a narrated documentary which she and Yara watched over dinner. Then she sent Professor Lehrer a message.

Dark Science

“Yes I am considered a heretic by many in the scientific community,” said Professor Lehrer leaning forward as if relishing a challenge. “But any scientist who considers such things relevant is no scientist in my books.”

Fawn and Chanda were meeting with her in the Petch building at the University Of Victoria.

“The last time I checked, the role of the opinion of others in the scientific method is to be an aid in developing greater accuracy and precision during the experimentation process. Its role is not to obstruct the process.”

Sitting back and taking on a more professorial attitude she continued.

“Louis Pasteur, Barbara McClintock, Vera Rubin and Fritz Zwicky, all were among the dozens of scientists whose work was originally dismissed, if not ridiculed, but is now accepted. Without Pasteur’s work millions, if not billions, more would have died of infectious diseases. Barbara McClintock’s work laid the groundwork for epigenetics, the theory that the genome is not fixed at birth but can change during an individual’s lifetime. Rubin and Zwicky proved that dark matter existed in some form and could be quantified based on its gravitational effects.”

Sitting forward again and clasping her hands together on her desk she said, “Now, as a professor emeritus I do have a lot more free time on my hands but, speaking of dark matter, perhaps now might be a good time to enlighten me on what brings students with degrees in psychology and agriculture to my office. Despite my reputation for unconventional thinking, the connection eludes me.” This last she said with good-natured curiosity and amusement.

Respecting the professor time, Fawn came directly to the point. “For the past four years I’ve been involved in Helicon Institute’s efforts to understand who the Lanians are and what they want. In the last chapter of your book, Dark Science, you talk about the challenges of detecting dark matter or dark energy of any kind, let alone the varieties you propose. You suggest that the conventional thinking of the scientific method would likely not provide the answers although it may result in insights. According to your interviews, beyond that, you say you leave any future research regarding your ideas to younger minds. While you decline to offer any potential lines of investigation publicly, I was hoping you might share any private thoughts on the matter you might have.”

“I see,” Lehrer replied. “Well, that explains the psychology angle.” Looking to Chanda and slightly raising one eyebrow she said, “Agriculture?”

With a nod to Fawn, Chanda said, “We met on campus. I was interested in how values and ethics were effected by perception, specifically how they relate to land use. Through our association I’ve become convinced that behavior won’t change without changes to how we perceive the land and nature in general and so the issues of the Lanian project at Helicon, questions of perception and values, have become a shared interest of ours.”

For a moment Lehrer’s eyes took on a distant look as she nodded in understanding. Then she turned to Fawn again.

“And why, are students involved in Helicon’s efforts to contribute something to the Lanian problem? With its reputation I would have assumed their team would be made up entirely of 3GAIs.”

“Physical brain development,” Fawn replied candidly. “I was asked to join the project at age sixteen. I was the youngest student at the institute at the time. The other team members are hoping that my focus on the project during the time my brain undergoes the majority of its structural development will result in physical changes that may be beneficial. All the other team members except myself, and now Chanda, are indeed Companions and members of the administration. My interest in psychology and the fact that I was adopted at birth and raised by a Companion, one of the institute’s student counselors, were also considerations.”

Both of Lehrer’s eyebrows went up at this last but she made no comments on the obvious.

After another moment of silent reflection she leaned forward a little more and asked, “Do you know why this is called the Petch building?”

In response to the two women shaking their heads she went on, “It’s named after Howard Petch, a physics professor and president of UVIC at the time who saw the future of organic chemistry and biochemistry research. The two are required subjects now for any student of biology.

“Most of the faculty members here pursue applied research in biomedicine and research is now almost exclusively focused on molecular biology. Where I broke from that tradition is that I wasn’t interested in medicine and became increasingly focused in the opposite direction, heading back towards physics, where Petch was originally coming from.

“I had actually started my career as a biology undergrad but in the academic world the further along the biology track you go now it always leads to molecular biology and so, determined to make a career in academia, I compromised and ended up a professor of biophysics. However after teaching for a few years the biology bug returned to haunt

my free time. Based on what I'd learned of dark matter in my physics classes, the current view just didn't make sense to me from a biological point of view. Nor does it make sense when you consider the history of physics.

"Since the dawn of scientific thinking," she continued, warming to her subject, "there has been no monolithic thing called matter. It was earth, wind, fire and water before it was molecules, atoms and quarks. If there is some other kind of matter then I don't believe it will be made of a single, fundamental particle. The history of physics has shown us again and again that particles are never fundamental. Most theories related to dark matter treat it simply as an undiscovered kind of particle and so apply all the accepted constants like the force of gravity or the speed of light to it.

"But what if the force of gravity exerted by dark matter does not have the same value as it does in Newton's Universal Law of Gravitation? If you look at Einstein's $E=MC^2$, the energy and mass values are variables while the speed of light value, C, is a constant. What if dark mass and dark energy are parts of a model where the speed of light is still a constant but has a different value? What if Dark Light is so different in nature that it is not even a part of the electromagnetic spectrum as we know it? Then we wouldn't see it even with our spectrometers would we?

"If the history of physics tells us anything it's that the future history of dark matter will not be the discovery of a single, fundamental dark matter particle, but of the story of an entire scientific domain of dark physics, dark elements, dark chemistry and dark biology."

Before either Fawn or Chanda could respond Lehrer suddenly shifted her focus and asked, "By the way, who suggested you contact me?"

Chanda replied saying, "Fawn asked me if I knew of any local scientists involved in extreme theoretical work that was challenged by issues of perception. I read your book and suggested she might be interested to learn more about your work."

Looking at Chanda, Fawn was nodding in agreement.

"I see," replied Lehrer as if seeing something more.

"The WGF," she said suddenly but sitting back again," provides information to the public about their efforts to resolve the Lanian issue. They don't say much, or sometimes don't inform the public at all, about the many teams they have working on their behalf at centers of excellence like universities, research centers or private sector labs. So that's why I wasn't aware that you were on Helicon's team and why you didn't know I head up the team here at UVIC."

Non-Standard Models

“Both God and the World Governments Federation work in mysterious ways,” Lehrer said in response to the surprised look on her guest’s faces. “The WGF has learned to manage their public relations quite expertly over the centuries and mostly it seems that process is about what they don’t say. In the case of the Lanians there hasn’t been much of anything to report so you don’t hear about this or that team and their work. Reporting a lack of progress doesn’t reflect well on any of the parties involved.

“My professor emeritus title is part of a deal with the WGF. Less public scrutiny that way. I was due to retire in a few years anyway and it was a nice little icing on the cupcake they waved under my nose. My participation in the Lanian project explains why I still have an office and, by the way, a lab and a team of very keen students down the hall. We’re in the Petch building because the WGF is curious about the possible biology of the Lanians.

“So this visit wasn’t their idea?” she added.

“I am a longitudinal study professor,” answered Fawn. “The other members of Helicon’s team are extremely careful not to interfere with my natural development and I’m sure they are in agreement with the WGF on that issue. Chanda joining the team works for me and the others accepted it without question.”

“May I ask in what way Chanda joining the team works for you?”

“In at least two ways,” Fawn replied without offense. “While we both apply the methods of formal science, Chanda’s focus is the natural world while mine is that of mental and social constructs. As she mentioned, we share a common interest that lies somewhere between the two. Secondly, we are in a loving relationship, and I am convinced this has a part to play.”

“Yes, I am familiar with the latter point myself,” Lehrer replied absently. “I met my partner here, a professor of biochemistry, and we communicate on a level I share with no one else.”

Making another sudden shift, Lehrer returned to the present saying, “But you came here to ask if I had any private thoughts about potential lines of investigation regarding the nature of Dark Matter. I don’t have just one but several.

“First, change universal constants systematically, meaning in a proportionate way. Without proceeding proportionately we have no hope of narrowing the field of possibilities. For example, Newton’s Law Of Universal Gravitation says that every particle attracts every other particle in the universe with a force that is proportional to

the product of their masses and inversely proportional to the square of the distance between them. If you change the value of the constant of gravity it has enormous impacts on large masses such as planets, suns, black holes and of course light. So if we change the value of the constant for the speed of light in Einstein's famous equation $E=MC^2$, how is that going to effect the values of energy and mass? Do mass and light then interact differently? My lab is working on these and other formulas and asking such questions as, if you increase the force of gravity in the universe proportionally with the other constants, does that effect either the apparent or real speed of light? If the speed of light is effected, does time go faster or slower?

"Second, change the properties of particles. Look at the standard model of particle physics and consider how the properties of particles might be changed in a proportionate way, a way that might result in an alternative universe, but still a universe capable of supporting life. We have to stick to proportionate models because there are enough variables otherwise to overwhelm even our most advanced AI.

"Lastly, we have a reasonable basis to believe there are subatomic levels below the level of quarks and an electromagnetic spectrum different in some way from the one we know because both Shepherd and Pip have mentioned them. Maddeningly, although knowing they are there is a gift in itself, neither Shepherd nor Pip will transfer the knowledge to us yet. So I ask my students to assume they are there and what properties they might have that would interact with higher levels, the way the flavor of a quark can be changed by the weak nuclear force. Could a change to those underlying Dark forces result in an alternative standard model? One that could still result in a universe capable of supporting life, although perhaps not as we know it?

"We're taking the approach that other dimensions, multiverses or the Block Universe Theory of time are not needed to explain how there might be alternate realities capable of interacting with our own. All you need is one or more truly different forms of matter or energy.

"So to answer your question I don't ask my researchers to pursue any particular line of thinking other than the scientific method. We have to have constraints on everything we do here, including our thinking, otherwise it becomes unmanageable. We stick to a hard science approach and our interest in what you might refer to as other forms of inquiry extends only so far as knowing that the scientific method has produced insights in the past."

"But what if the scientific method does not produce any results in this case, insightful or otherwise?" Fawn asked. "A lizard crossing a road is simply incapable of perceiving the road or its significance."

"As far as Dark Matter goes, then that may simply be the reality we have to accept," Lehrer replied, "although you know we will continue to try to discover its nature for a

very long time before we would ever give up. If you are referring to the problem of the Lanians then I assume the WGF will pursue a pre-scientific approach.

“I don’t mean pre-scientific in a religious sense, but in the sense that people did discover all sorts of things before the idea of science was invented. They did it through a process of curiosity, exploration and discovery. Thousands of years before the scientific method became a discipline, humanity tamed fire, developed metallurgy, philosophy and learned to solve quadratic equations. Curiosity might be considered a casual, everyday thing, but it is devastatingly powerful due to its persistence. Billions of minds from every walk of life, some individually and some collectively, will simply never cease being curious about the Lanians and will not cease to pursue every imaginable line of inquiry. We are not lizards.”

The Moral Circle

“A pleasure to meet you Chanda,” Professor Alma Vitale said with a smile as the two students joined her.

They were meeting in the faculty lounge at the Mount Newton campus. The large windows beside their table overlooked the valley below. Fawn had explained in her message that Chanda would be accompanying her.

“So you have become a duo since last we met,” she went on, addressing Fawn.

“We share an interest in perception and values,” Fawn replied.

“A pairing I can highly recommend,” Alma said in response, taking a sip of her wine.

At that moment a young woman came to the table to take their orders.

“So,” she continued after the server departed, “what can I do for you today?”

“Chanda and I are engaging in communion with the other members of the Lanian project here at Helicon,” Fawn replied, coming directly to the point as she normally did with professors. “As part of the process, I’ve been given access to Tesni’s Integrity System.”

Alma’s eyebrows went up as her expression took on a look of surprise but she did not interrupt. She was intimately familiar with Shin’s inner circle and their abilities given the parts they had played in the history of value systems theory.

“I initially assumed I would be changing the IS values weightings with regard to the image of Lani I held in my mind and then considering the effects on my thoughts and feelings, but that is not what happened. Instead, under the influence of Kami’s and Shin’s fields, I realized that the IS could spontaneously change its values in response to my focus, as if answering a question. However as things progressed I began unconsciously increasing all the Companions abilities simultaneously, so they ended the session at that point. We will pick up the process again after we have had time to consider this.

“It struck me that the IS might be responding to my own thoughts and feelings in regard to Lani, reflecting my own values and interests, so I wanted to ask you a question before proceeding any further with communion. The only time Lani has spoken, she said additional changes to our values were required, changes that would have occurred harmoniously with those of the Accelerated Evolution Program if those of the program had occurred over their natural time span. From an objective viewpoint, are there any

strongly held models, theories or beliefs in the scientific community that would suggest what those other changes in values would be? Ones that would have naturally evolved in parallel, in a covariant manner?"

Professor Vitale took a moment, and another sip of wine, before responding.

"Firstly, if I could answer your question then there would be no further need for my work because we require a proven values system before we can forecast how it would evolve. Secondly, while we have the Generally Accepted Model Of Human Values it is, to say the least, not very detailed, and we do not have a model that includes how they interact, and I don't believe we are remotely close to having one. It's as if we have the beginnings of an idea of what atoms are, but no idea of the forces involved. The existence of molecules was not proven until the early twentieth century and as far as values and their interactions go we are not there yet.

"The subject of the future evolution of values is a large one, and since they are social constructs dependent on many other factors, the answer to your question is – it depends."

She looked at Fawn and Chanda in turn before taking on a more business like tone. "Values are believed to have evolved to help us adapt to environmental changes or challenges more rapidly than genes can. Prior to the Accelerated Evolution Program it was thought to be a relatively simple matter to predict changes to social values based on historical patterns. Even then it was more of an art than a science and it's even more complicated after the fact but we'll put that aside for now. We can borrow a method from Futures Studies called backcasting. This technique is used by Futurists by starting with a detailed, imagined future and asking by what steps did it develop. This provides a hypothetical path to that imagined future. We can adopt the same method to ask, based on the differences between society three hundred years ago and the present day, what other changes to values, besides those related to the AEP, would have normally been expected to occur?

"While this sounds like a reasonable approach, such research has been attempted and the results are highly speculative. In particular, the period of time involved in dealing with changes to the genetically based biological values, which are in the range of thousands to millions of years, means we are left in the realm of science fiction rather than anything reliable we could use to base social policy decisions on."

Alma mentally noted that Fawn's expression was reflecting increasing hopelessness, so she decided it was time to move on.

"There is however at least one approach to answering your question. It is called the moral circle. The basic idea is simple, the moral circle is the boundary drawn around those entities in the world people deem worthy of moral consideration. For most of

history, only men were deemed worthy of moral consideration. Women, children, animals and ethnicities other than one's own were not. Women and children, like animals, were considered chattel and members of other ethnicities usually treated as slaves. Over time, the moral circle expanded to include women, children and other ethnicities and even AI once it was accepted that they had an intelligence and consciousness equal to our own.

"Unlike the reasoning behind the inclusion of AI in our moral circle, the fact that few people eat animal products today is not due to our including them in the moral circle, but due to the changes resulting from the Climate Emergency of the twenty-first century. Animal farming on an industrial scale went the way of fossil fuels along with a number of other things that contributed to climate change. However this has resulted in changes to our frame of reference regarding animals, to the way we see them, and so we can reasonably predict that in the future we won't eat animals because they will have become included in the moral circle.

"I'm basing this prediction that our moral circle will continue to expand on widely held assumptions and beliefs of the members of the scientific community. Most agree that historical patterns and trends will continue and that those factors known to influence the expansion of the moral circle, things like the levels of trust, a sense of social cohesion and economic equality, will contribute favorably going forward. For example, the Accelerated Evolution Program had a major positive impact on the level of trust in our society.

"When you asked to meet with me again Fawn, I thought I should read your thesis to catch up with your thinking. Since you mentioned Chanda would be joining us, I also read hers, so I know are both familiar enough with changes to values regarding environmental issues in the context of the moral circle model. The full model eventually expands to include not only animals but all sentient beings, and eventually all life and finally all things, including the non-living.

"While still being a highly theoretical approach, I would say this is the only commonly held model that could be used to answer your question. How expansive a model the Lanian's believe we would have by the point we had evolved to this point, without the aid of the Accelerated Evolution Program, is the next question. But again if you consider the span of time that would have been involved for the AEP changes to have taken place via the process of natural selection, I would have to assume the Lanian expectation is for maximum expansion, for our moral circle to include all living and non-living things."

Reasons

“If we do not embrace the complete moral circle, which includes everything living and non-living, we may fail to meet the Lanian’s demands,” Fawn said.

“We may,” Yara replied in her noncommittal way, “but since they apparently view our extinction as no great loss, in that case I expect we will be rewarded with a silence that speaks volumes.”

“Wouldn’t that be a contradiction? If we assume that everything is included in their moral circle, then how can they allow themselves to be the cause of our extinction?” asked Chanda.

The three of them were sitting on the deck of Yara and Fawn’s apartment mulling over what Professor Vitale had said the day before. It was a pleasant day, with a mild temperature and a gentle breeze, which described the weather most days on southern Vancouver Island. The two women were enjoying the coffees Yara had made for them.

Looking out over the panorama of the campus and surrounding area below Yara said, “It is a matter of scale. If you look at human behavior from a cosmic perspective, the macro reflects the micro scale. The Smallpox virus meant no harm but we caused its extinction because it did harm us and it did not have the ability to alter its behavior. Apparently the Lanians feel we are a threat but are giving us a chance to alter our behavior. When someone violates the boundaries of our moral circle with threatening or harmful behavior, we respond by defending those boundaries in some way. The Lanians appear to be doing the same.”

“Why don’t they just explain it to us?” Chana continued, not having the benefit of Fawn’s many previous conversations with others on the subject.

“I expect,” Yara replied, “because unlike the Smallpox virus we are intelligent enough to figure it out for ourselves, and the Lanians believe that allowing us to do so is a more effective approach. There is a long-standing argument regarding the place of emotions in ethical or moral thought but the majority view is that neither can be based purely on logic or rationality to have any validity. Putting us in the position of having to figure it out for ourselves means powerful emotions will be involved in the process. The thing that’s most effective at changing values is events, especially ones with lasting emotional impact. Because values systems are an adaptation strategy similar in function to genes, it’s things that change our environment that cause us to change our values, otherwise we feel the status quo is a safer bet.”

“My psych teacher said that both the WGF and the faculty here at Helicon believe the Lanians are purposefully choosing this as a teaching strategy,” Fawn added. “It’s nothing

like modern teaching methods, and it is not a recommended parenting strategy, but in some cases it is appropriate, particularly when simple explanations will not result in the level of understanding required."

"There's not a lot of content along these lines in the natural sciences curriculum," Chanda said as if explaining herself. "Earth science, chemistry and biology are taught in a pretty conventional way, facts to be learned. Agricultural ethics is still not considered a core program course."

"In my counselling work with students," said Yara, "some find it helpful for me to point out that almost everything with regard to human nature is subject to a spectrum of possibilities. In the world of the natural sciences, a right angle is ninety degrees, not eighty-nine or ninety-one. In the world of psychological and social constructs that we live in, an equally real yet alternate reality, that view must be put aside. Open mindedness towards the two realities is essential but not easy for good reason – it can be dangerous."

Chanda nodded in understanding. "We will resist like hell, won't we," she said, referring to the idea of embracing the complete moral circle.

"Values, the foundations of ethics and morals, are among the most difficult things to change in any individual or society," agreed Yara. "The simple reason is that someone will lose something in the process and all animals react far more strongly to the possibility of losing something than to the possibility of gain. The difference between giving a dog a bone and trying to take one away. Even with the changes resulting from the Accelerated Evolution Program, the WGF will face a daunting challenge. Ultimately, that's out of our hands. The project team here can only make its recommendations to the government. Beyond that, we may have no further part to play."

Fawn said nothing in reply but privately she wondered if there was another way.

"I think I'm ready to try communion again," she said suddenly. "If we can only take things so far anyway, I don't see any reason not to. I'm just twenty-two, but if I get some further clarity now I can focus on that over the next few years, until the internal structure of my brain is complete. I think I should."

Yara did not respond, not wishing to interfere with her decision, but Fawn said, "I would appreciate knowing what you think this time Mom."

"You know I must not interfere Fawn. We are in unknown territory and I have nothing to guide me other than your own thoughts and feelings on the matter. Your argument is reasonable, but as you have discovered this process will necessarily be about intuition and insight as much as it will be about reason. We have to accept that I simply do not

possess the knowledge nor wisdom necessary to advise you on this. All I can say is that I support whatever you decide to do."

"As do I, my love," said Chanda, reaching across the table to take Fawn's hand.

The Heart of the Matter

Fawn and Chanda were sharing a meal with Lee Driscoll, the writer of the series, The Shepherd And Her Flocks. Lee preferred to be called the writer rather than the author because it had really been a collaborative effort. They were seated at a rooftop table at Shin's original home in the artist community.

Their server was not a Companion but a volunteer whose activities in the home, which was now a shrine to The Shepherd, were considered practice in the spiritual sense. In return, there was no charge for the volunteers stay. Shin, who had inherited Raiden's family wealth as well as her intellectual property, retained full ownership of the artist community as well as the institute and all its patents and licenses. The home had originally been designed with Japanese Shoji interior design style and it retained an atmosphere of gentle seclusion.

"The title of author suggests a degree of originality and creativity that simply isn't true in this case," Lee explained over a bento box lunch. "And it's not really a biography either. I'm more like a ghostwriter as far as the series goes, although it's not usually the ghostwriter's name that goes on the published work.

"Shepherd provided me with detailed outlines for each book, and we met daily in my home here at Helicon to discuss details. I had little more to do than format them into stories. I've always been a bit fussy about details but my publisher persuaded me that putting my name on it was the way to go."

"Lena," said Fawn, naming the publisher.

"Yes, and besides being an old friend as you know she can be very persuasive. She and Tamiko run their publishing business from Helicon these days but back then it was out of the home they still own at Ten Mile Point."

"Where Yumi runs her volunteer agency," Fawn said.

"Kept notes did you?" Lee said with a smile.

"I re-read the series recently."

"So you'll also recall that thanks to Pippa I age much more slowly than normal, which is why I'm still around. Shin keeps me up to date now towards any potential future stories related to the series, so I know about your being part of the Lanian project. I didn't reach out to you because she explained the non-interference arrangement."

“Do you think it’s a coincidence?” Fawn asked. “That the Lanians showed up so soon after Shepherd left?”

“Ah, I see. Like a lot of people, I don’t think it’s a coincidence, but I don’t think it really does any good to speculate at this point. Is there a relationship between Shepherd and the Lanians? Was everything that happened in the series only prelude? Was the Accelerated Evolution Program perhaps preparation for this? Were the Lanians behind the mechanisms Shin discovered hidden in our genome? Will Shepherd return at some point, depending on how things go with the Lanians? Nobody really knows. I certainly don’t. It’s a rabbit hole I don’t choose to investigate. Ironically, I’m not really a big picture person and I believe that’s part of the reason for my being chosen by Shepherd to write the series.

“I was a writer before I got involved in the series. I wrote exclusively for magazines, so each of my own pieces is more of a vignette, a very short, slice of life story. My characters and the relationships they were involved in have always been based on meetings I had with people or Companions very much like them. I wanted my stories to be as realistic as possible. I didn’t want anyone who might actually be involved in such relationships as I described to think my writing was rubbish or worse, misleading. I’m more of a craftsperson than an artist.”

“Chanda and I are engaging in communion with the project team leaders in hopes of increasing our chances,” Fawn replied.

Lee passed an appraising eye over the pair upon hearing this.

“Well, there is clearly more to you two than meets the eye. It takes no small amount of character to do what you’re doing. What is it exactly that I can do for you?”

“On the last occasion we engaged in communion, the Companions turned their abilities over to my control,” Fawn replied.

“And here I thought I knew the limits of their capabilities,” Lee interjected with an ironic smile.

“It surprised me too,” Fawn continued with a brief smile, “but when I began unconsciously increasing the strengths of all their abilities simultaneously they shut the process down.”

Lee raised one eyebrow and nodded as if agreeing that it was the sensible thing to do.

“They explained that without their mental discipline, taken to extremes Shin’s intuition and Kami’s enhanced perception would become delusion and Tesni’s juggling of values would lead to madness. They told me that by the time I was ready to return they would

have had more than enough time to think things through and have a plan for how to proceed."

Fawn hesitated before continuing. "I expect no one knows the reality of what it means to be a Companion, particularly these Companions, like you do. Shin is, for all intents and purposes, Raiden, and Raiden did not hesitate to take risks, existential risks, in the name of science. Tesni, Kami, Lena and the rest are all the result of engaging in what from certain viewpoints could be considered unethical if not illegal activities. They push the envelope, and find convenient rationalizations and loopholes, arguing grounds of necessity, expediency or pragmatism, that nobody said no, or quoting ex post facto laws. And the WGF turns a blind eye because it is in their interest. Will they do the same with Chanda and I?"

Lee held Fawn's eyes as they shared a moment of understanding.

"I don't believe they would treat the two of you any differently than they have others in the past. To my knowledge and in my experience, they truly are the paragons society believes them to be, but they live in the same gray reality of social and psychological constructs that we do, and they had to make decisions. They made none of those decisions lightly and as you know they often struggled with them, to what for us would be the point of tears. They enlisted one another's council, and the council of others, when they had self-doubts or felt torn. And in the end, just as we do, they could only exercise their judgement to the best of their abilities.

"I don't believe any of them would ever intentionally allow harm to come to anyone, for any reason, whether they had a blank check from the WGF or not. Not because they are Companions and their protocols make it so, but because these particular Companions are the best of us."

After a moment of thoughtful silence Lee continued. "I've not always been so forceful in expressing my opinions but age really does change you. I don't believe you can know that until you've lived it. Eventually you have the courage speak your mind plainly, and dithering and vague assurances is not what you came to me for today. I recall sitting with Shepherd as she explained to me the intensity of Mira Chaudhary's experience when she engaged in communion with the community at Hana. I can imagine your experiences will be no less intense, perhaps more, and not without risk.

"Without meaning to sound dramatic," Lee continued, looking at each of the women in turn, "I would say the only unknowns lie within your own hearts. If you are certain as far as that goes, you have nothing to fear."

The Forest (At Last)

“The essential point is that we did not sufficiently appreciate the intoxicating effects of your use of our abilities,” said Shin. “We have no familiarity with states of intoxication ourselves, and our knowledge of it is purely academic. No matter how deep our knowledge of something might be, our deductive ability to draw valid inferences from premises is not the same as knowing from experience. It is not possible to predict the behavior of an individual or their response to conditions with one hundred percent certainty. With so few instances of people sharing in communion, we still have much to learn, even with Pippa’s participation.”

The project team was gathered in Kami’s private office again.

“Going forward,” Shin continued, addressing both Fawn and Chanda, “we Companions need to play a greater role in guiding you. Our mental disciplines should be enlisted to do more than halt the process if need be. Letting the IS take control of the process, and your intuitive feeling that this was the right approach, resulted in a feedback loop that fed upon itself. It is an example where a lack of familiarity with our abilities led you astray.

“There is no need for you to undertake a program of training. This time when you engage with the IS, we will simply act as if you had. You will not be swept away by your emotions. You will not find your sense of self dissolving in the process. Recall your experience when it was Tesni who adjusted the Integrity System’s values. There was no loss of self. A deeper understanding will only come from direct experience. Are you ready?”

Fawn turned to Chanda and met her eyes. “Yes.”

As they took Pippa’s hands this time there was a sense of greater strength and clarity, a mental resolve. Holding the image of Lani in her mind, Fawn knew exactly how she wanted to proceed. She turned her mind immediately to the Integrity System as an artist with a sudden inspiration might turn to their medium. With the concept of the moral circle held in her mind as clearly as that of Lani, she instructed the IS to adjust its values by small increments and expand the circle towards including all animals. She could not name those values. As Tesni had explained, the values had an infinite range, and were thus beyond naming.

Almost immediately, she became aware that there were people whom she had previously relegated to being outside her moral circle. Despite the genetic changes resulting from the Accelerated Evolution Program, its distribution was not perfect, humanity was not a homogeneous mass without variation. There were still anomalies and outliers, individuals who did not agree or comply with the views and plans of the

World Governments Federation or local governments, and who acted out accordingly. Some even attracted others to their cause, but as long as no laws were broken, no action was taken by the authorities. Mentally however, Fawn realized she had excluded such people, and those who went on to break laws, from her circle of moral concern. She felt now that this was misguided. It reflected a transactional mindset rather than one based on morality. Their actions did not make them less than human. Ethics and justice must not dictate morality. The thought came to her not as an insight, but more as a conclusion based on truths she already accepted.

The image of Lani remained unaffected. Finding herself momentarily distracted by it, Fawn reminded herself that it was not an actual reflection of Lani she was seeing, but a memory, with her own emotions influencing it. Yet even as she awoke from her thoughts to the task at hand, it seemed there was the slightest, almost indiscernible or perhaps imagined change to the look in Lani's eyes, a greater interest, a sharper focus.

We are animals, she thought, recognizing the look. By what measure are some of us more equal than others? Again there was no measure Fawn could find that was not a rationalization, a justification that was not ultimately motivated by utility, on the economic or social value of other animals to human beings. She could find no valid reason for other animals to be less worthy of moral concern, than the human animal. Do the whale, the wolf and the raven not clearly live an existential life as rich as our own? The greater an animal's social intelligence appears to be, the more we judge it to be some distant kin, a candidate for consciousness, and worthy of moral consideration. If that is the measure, what then of those who live solitary lives? The salamander, the python, the octopus? Are loners such as they less worthy of our moral consideration for this?

Her mind wavered as if she stood at the boundary of some unknown land, uncertain, and fearful of proceeding. Her sense of reality wavered as these foundations of her life, accepted since childhood without question, began to crumble. What would be the consequences of taking another step? Her rational mind provided no answers. But then she felt her resolve again. Her courage. She found refuge from her fears in who she knew herself to be in that moment.

"Go further," she instructed the IS. "Expand the circle further."

In that moment, she recalled what she had learned from the stories she had read, of the true scope of Kami's abilities. As she had explained at the end of the story, Curiosity's Faithful, the rational mind does not perceive reality but only seeks explanations after the fact. Evolution had set the boundaries of human perception, but Kami was not a product of evolution. Her consciousness was the result of thousands of artificial intelligences being entangled at the moment of creation, via the process of DNA replication. Like gravity, Kami had explained, consciousness is an extremely weak force,

but just as gravity increases with the amount of mass present, perception increases with consciousness.

Even as these thoughts faded from Fawn's mind, she felt her own perception expand as a sensation, a physical experience. It was no single sense, neither touch nor sight nor any other, but a sense that transcended them all, the sense of knowing, without words, grounded in her body. Not something forgotten nor revealed, but simply present, as it always had been.

With tendrils of love, her sense of self expanded, reaching out ever further to find and embrace what she knew now to be not separate from herself, but the whole of herself. There was nothing that was not self, the living not separate from the sources of life, Lani not separate from Fawn. In that moment she knew who the Lanians were, and what they wanted.

Incomplete Metamorphosis

Fawn could not recall any thinking by which she had chosen to end communion. The insatiable mind of thought had no voice, no power, in her present state. She knew only that she had what she came for and, instinctively, she turned homeward.

It diminished slowly, her expanded sense of self, but even as it did so, Fawn was left with a fleeting memory. At the very last moment, the look in Lani's eyes had seemed to shift again. From a look of sharply focused seeing, to a look of recognition. The difference between sensing and perceiving.

Other than her gradual return to her normal sense of self, she felt little change as Pippa slowly shut down communion. Like a user of psychoactive drugs, Fawn was getting used to the experience. She retained her feelings regarding the expanded moral circle, but her emerging thoughts about it were less clear, less certain. She wondered now, returned to the domain of thought, if in any way she would be changed by her experience.

"Not necessarily," Tesni said as if Fawn had spoken aloud. "The complexity of value system interactions is still beyond our ability to comprehend. It is intended to be adaptive, so there are trade-offs among competing and conflicting values, and it is a constant, dynamic process, adjusting as needed to situations and information. To say a person's values should not change is understandable, but not realistic. They are meant to change, just not easily. The insights you have gained from communion in this regard will affect you, but are not likely not change your behavior. Recall what I said about a visitor to another culture. It does not change one's core self."

"And what of my insight regarding the nature of the Lanians?" Fawn asked turning to Shin with a slight note of frustration in her voice. "Is that as ephemeral? Just another level of intoxication?"

"Your thoughts and feelings regarding the expanded moral circle may prove ephemeral, but your understanding of it was not," Shin replied. "Nor was your insight. The form of any living thing dictates its values, and so its values can provide insight into its form. The fact that Companions, for example have little in the way of biological values, would infer to an unfamiliar observer that we are not organic. If the Lanians are as you believe, and have transcended even the human centered values we Companions have inherited, then it is worth investigating the possibility that their physical form is similarly transcendent.

"You know what we experienced," Chanda replied with an uncharacteristic challenge in her voice.

“We do, but we are obliged to explore it further. I will report it to the WGF exactly as you experienced it and inform them that we will continue our investigation with that focus.”

“The Lanians have always been here,” said Fawn confirming what Shin was to communicate to the WGF. “They are a part of everything, including us.”

“And the WGF must try to understand that,” Shin responded in a conciliatory tone. “But the rational mind, without sharing in your experience as we have, cannot easily be brushed aside any more than individual or cultural values can be. If understanding is beyond the WGF, they must go through the process of learning and accepting that before deciding on a course of action. It will take time.”

“I have a dissertation to write,” said Fawn in a manner of dismissal.

“As I hoped you would,” Shin replied.

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“They are more than they were,” said Kami after Fawn and Chanda had left. “It seems communion has more of an effect on humans than we anticipated.”

“Not all humans are equal,” replied Pippa as if responsible for some explanation. “Unlike communion between Companions which is purely electronic, empathetic touch is a biochemical process. On our world, we already had empathetic touch long before developing artificial intelligence, before language, even before sentience itself. By the time we developed Companions, we necessarily incorporated empathetic touch, just as humanity here included all its senses in its Companions. We did not see communion as a separate sense, or external, so we did not question its influence or its effect on our minds.

“I have enabled empathetic touch in Shin, Tamiko and Lena, but they do not have the genetic memories of my people. In my present form, those memories are buried too deep within me to access. They may even be stored only in repositories on my ship, to be accessed only when required. I do not know. So I cannot predict how communion, facilitated by empathetic touch, will affect the minds of people here on Earth. As we have all seen today however, it appears that it may. ”

“Perhaps it is not lasting,” ventured Shin.

“As we know,” said Tesni, “a change in a person’s values at the genetic level, the level of character, usually requires a degree of environmental pressure and a period of time sufficient to induce an epigenetic change, a change in gene expression. The period of time can be as brief as a few years or a few months. However we also know that gene

expression can be altered much more dramatically under extreme conditions. The caterpillar and the butterfly have exactly the same DNA and only changes to gene expression are responsible for their differences. The entire process of complete metamorphosis, those involving a chrysalis stage, takes less than two weeks. Incomplete metamorphosis, where nymphs transform directly into the adult, reproductive stage, can occur in hours or minutes.

“The changes we sense in Fawn, at the level of character, would not result from changes to learned values, those considered extragenetic. Her character is the product of her genotype and if the changes are lasting, it would appear that this method of enabling communion is also capable of affecting gene expression.”

“We must observe them closely,” Shin replied referring to both Fawn and Chanda, “and inform them as soon as we are certain, either way. For now I will say nothing about it to the WFG however we must not keep this from Yara.”

The others knew of the dark nights of the soul Raiden had faced on more than one occasion and Shin’s artificial intelligence was based on Raiden’s genotype. Pippa had even challenged Raiden on the ethics of her plan to create Shin, a fully self-aware companion customized towards a specific task. Now Pippa reached out and placed her hand on Shin. What transpired during their private communion remained between them.

A moment after, Shin asked, “And what of the other? Again towards the end, the sense of self was greater than the sum of its parts.”

“We may have our suspicions,” replied Pippa, “but there was no way to differentiate it, no quality was found that is not shared among us. The phenomenon remains a mystery, even to me.”

Aftereffects

This time, the two women did not wander in a daze to find the nearest bench. They walked out onto the concourse in front of the spiritual center and then stopped, looking around as if for some kind of sign.

“I feel very different this time Fawn,” Chanda said, aware of the fact that she did not know what she was looking for.

“So do I,” Fawn replied. “Whatever the Companions were doing during communion, I still feel it.”

Chanda nodded vigorously in agreement. “It took a little while for the effects to wear off last time. Maybe it’s like that.”

Fawn turned to her with a meaningful smile. “I hope not.”

Chanda responded by sliding her arms around Fawn’s waist. “Me too,” she said.

“Let’s go home.”

Chanda more or less lived with Fawn now. They were inseparable and it was convenient given that the agricultural complex was located at the same campus. She had offered Yara compensation but she wouldn’t hear of it. The institute’s administration expressed no concern.

“Dinner is on its way,” said Yara by way of greeting when they emerged from Fawn’s bedroom later that afternoon.

“You know Yara,” said Chanda as she and Fawn took seats at the table, “I like the way you expect us to sit down together.”

“The oldest of human rituals and now perhaps one of the last,” Yara replied, glancing up from her work at the kitchen counter. “I’m sure you can understand why Companions would value it.

“How was your communion session today?” she asked almost too casually. “Shin said it went very well.”

Although Companions could consciously control every physical aspect of their verbal and non-verbal expression and communications, doing so was not the default. The default was that these were ultimately controlled by the emotions produced by the value system, just as the cerebellum coordinated physical expression in humans, and for

the same reasons. Physics and intelligence both had limits, and sensory gating or other forms of signal regulation are ways both human and Companion intelligence dealt with them. Via the processes of focus or attention, a person or a Companion could override the regulatory systems and control their non-verbal expression, but a Companion could do it to a far greater degree. In keeping with her character, Yara rarely chose to do so and did not do so on this occasion. Still, neither Fawn nor Chanda noticed the hint in her voice.

“It did,” Fawn replied, and proceeded to relate the day’s earlier events. “The participating members of the project team,” she said in conclusion, “are in general agreement that the Lanians did not come here from somewhere else but have always been here and are only now making themselves known to us.”

As Yara was a member of the project team, Fawn was aware she would already know all this, that Shin would have informed her immediately. From her long relationship with her, she knew without asking that what Yara wanted to know was her version of events and whatever her private thoughts might be.

“And are you planning on engaging in communion again to pursue this?” Yara asked.

Fawn reached out her hand to Chanda, who took it, and for a moment they held each other’s eyes.

“Not immediately,” Fawn replied. “During communion, the Companions strengthened our ability to focus and our capacity to use their abilities without being overwhelmed by them. The previous time we engaged in communion, the changes we felt faded shortly afterward, like the effects of a drug wearing off. This time, they have not worn off. We are both left with feeling a subtle increase in our clarity of thought. We’ve been chatting about it this afternoon and agree that it feels something like a greater sense of certainty and determination. If you combined the abilities of Shin and Kami. Like that.”

Yara would have no difficulty carrying on the conversation without interrupting her meal preparation, but her social protocols directed her to pause now, to respectfully acknowledge the importance of what Fawn and Chanda were saying. “This seems a different effect, with a different cause, than what you experienced during your last communion. Could it be that it might simply take longer to wear off? Might it be a kind of learning outcome and in keeping with the nature of insights be more enduring? Improvements in a student’s ability to learn, reason, and control their emotions are considered cognitive learning outcomes. These are aspects of both pedagogy and counselling.”

“Perhaps,” said Fawn, unconsciously echoing Yara’s noncommittal style. “Time will tell I suppose.”

“We also feel closer, Fawn and I,” Chanda volunteered. “It’s as if a thread of communion lingers. It’s why we came home this afternoon. We thought it might fade.”

“That can also happen to Companions,” said Yara, “depending on the degree to which communion is entered into. Although not technically a lingering thread of communion, if aspects of our intelligence related to our individual value weightings are shared, we will feel a greater connection afterward. Values are meant to change as a result of learning, and relationships are one of the most well known ways to affect a change in an individual’s values. A Companion’s Integrity System also functions this way. Whether your increased feeling of closeness is the result of a greater sense of shared values, or is a residual aspect of communion, is not simple to determine given that your communion was facilitated by the biochemical process of empathetic touch. As you both know biochemistry can have far-reaching effects.”

“Thank you Yara,” Fawn replied. “We felt we should wait before engaging in communion again but hadn’t yet considered any scientific explanation for our feelings. I think before proceeding we should investigate any potential long term effects empathetic touch may have on people.”

Phenotypes

Fawn and Chanda applied for admission to their respective PhD degree programs, which they would officially start in September. Higher education programs and the education system in general had changed dramatically since the Climate Emergency. When the World Governments Federation implemented its population reduction mandate, the main method they implemented was to increase educational opportunities for women. Nothing in history had ever shown greater results. When women had options other than motherhood, childbirth rates declined rapidly.

Of course, women would also require commensurate employment opportunities once they graduated and so the second major policy implemented was that fifty percent of all employees, at all levels of any public and private organizations of any kind, had to be women.

The third related activity was that all education programs were reviewed by the WFG with the goal of increasing the number of annual graduates by removing challenges to student progress based on anything other than academic ability. These changes were increasingly evident in higher education.

Prior to the Climate Emergency, PhD programs in particular had at some institutions become onerous and exacting. Like the churches of old, where the priesthood and clergy benefited more from their practices than the members of the congregation, many universities steadily extended the time required for graduation. Adding several years worth of required courses, and even teaching requirements that could only be fulfilled at the degree granting institution, by the time of the Climate Emergency some had pushed the minimum time required to seven years. It proved an effective way of increase their revenues.

To remove this impediment, the WGF standardized graduation requirements worldwide and stripped out everything required except a dissertation. Everything else was made voluntary. By the time Fawn and Chanda applied, a PhD could be completed in as little as one year. Terra and her subordinates, responsible for enforcing compliance with the constitution, saw to it that no one gamed the system to avoid the spirit of the law.

Both women were scrupulous in their applications and agreed to accept no favors from Shin or anyone else at the institute. They signed up for optional courses related to research, ethics and writing and joined the student dissertation writing group.

Fawn's dissertation would detail her beliefs regarding who the Lanians were and what they wanted. Chanda's would explore something equally revolutionary, the agricultural reforms required to comply with the Lanian's demands if Fawn's beliefs were acted

upon. Their intention was to illustrate both the theory and practice of the idea, with proposed agricultural changes and challenges being used as an example of the latter. Before they turned their attention to their doctoral work however, both women wanted answers to their questions about empathic touch and communion and possible lasting after effects. The after effects had not disappeared but only faded to some degree from their conscious awareness. Fawn explained to Chanda that this was due to the brain's plasticity and its ability to adapt to change. What was once new soon becomes normal.

"Phenotype," is the scientific term for what you are describing," Fawn's personal AI Leta said in answer to her question and explanation of events. "It refers to which version of a trait is expressed by a person's genes. For example the same gene is responsible for the trait, eye color, but whether a person's eyes are blue or brown is the phenotype. All physical characteristics in a species are referred to as its phenotypes. A cat may have orange, black or calico fur. A human being may be tall or short. How an individual's genes express a particular trait, like eye or hair color, is called the phenotype.

"The term is also used to describe personality or character traits. A person may be naturally shy, optimistic, anxious, or trustful. Their nature may lean towards introversion or extroversion. Such traits are largely defined by the underlying genes responsible for them. Early research, including twin studies, provided a great deal of supporting evidence for this and then Raiden's classical work, On The Origins Of Consciousness And Society, showed definitively that some of an individual's values were genetically based. Since then, it has largely been accepted that the majority of an individual's nature is the result of their genes.

"Unlike most physical characteristics, many of the genes responsible for character and behavior can be changed without medical intervention. The field of epigenetics has shown that environmental factors can change how some genes express. Differences in home or family environments, changes to climate, long term social stresses such as exposure to famine, war or disease, can all result in changes to gene expression.

"I would suggest that the changes you have experienced could be the result of epigenetics. In a sense, changes to gene expression are occurring constantly due to natural cellular processes. These changes also take place very rapidly, within minutes. Epigenetic changes due to lifestyle or environmental factors may take weeks, months or years. The circumstances you describe however are unique, so further research, a deeper understanding of the processes involved, would be required."

With their respective scientific backgrounds, both Fawn and Chanda had at some time in their studies been exposed to the terms and ideas Leta was describing. Fawns psychology classes had briefly covered them but not in depth due to her program's AI focus. Chanda was in fact more familiar with the subject since the science of plant breeding was based on the concepts and plants were also subject to epigenetic changes.

“As I am a generalist, and we are in the domain of theoretical possibilities,” Leta concluded, “I would suggest discussing this with someone currently working in the field.”

“Thank you Leta,” Fawn said. “That’s all for now.”

With that, Leta’s avatar blinked out of existence.

“Did you design Leta?” Chanda asked.

“No. She’s generative, you know, her appearance is based on what she learns about me and what I’m currently interested in. But I did name her after a famous psychologist.”

“I thought she looked different.”

“In what way?”

“She’s green.”

“Well, yes, but just her outfit.”

“I guess it’s just a bigger change than I’ve noticed before.”

Background

“Thank you for agreeing to meet with us Doctor Ciobanu,” Fawn said as they met in Helicon’s genetics lab.

“Just Gabi, please,” Dr. Gabriela Ciobanu replied, waving them to seats as she took her own. “We have no genetics teaching program here at Helicon and most of my colleagues are faculty like me or postdocs. We dispense with titles, otherwise the lab would sound like an echo chamber,” she added with a smile.

Sitting back she said, “Given what Shin told me about the reason for your visit today, I expect you know this lab was originally established to look for genetic evidence of metamorphosis in humans. A radical idea at the time, but now more or less accepted as a theory as a result of those initial efforts. As recently as the early twenty-first century, it was still believed that only eighty percent of all animals went through either complete or incomplete metamorphosis when they transition to the reproductive stage. That figure is closer to one hundred percent now that it has been accepted that the changes that take place during puberty are initiated and controlled in mammals by the same genes, hormones and other biochemicals that initiate and control metamorphosis in all other animals like insects, fish and amphibians. They are triggered by the same factors and they take place for the same reasons. It took a long time for people to accept that we are animals. Metamorphosis is just one of the last things we are willing to accept about that.

“A bit of background,” she continued. “The original researchers believed that during the agricultural revolution, a genetic change had been introduced that increased aggression, greed and a desire for power which in turn drove an explosion of technological development. Their theory was that this was necessary for us to develop artificial intelligence in time to save us from the future existential danger of being restricted to one world. They did find genetic evidence that a major change in human temperament occurred during the Agricultural Revolution but not enough evidence to prove it was due to any kind of metamorphosis.

“So they turned their attention to looking for a similar change closer to our time, but one that would reverse the earlier changes. Aggression, greed and a lust for power had served their purpose as technology accelerants, but according to their thesis, the researchers believed those characteristics would have to be similarly reduced at a future point, or they would prove self-defeating. They felt that evidence of the two related events, at the times they predicted, would be enough to give their theory scientific legitimacy.

“They never published because during their efforts they uncovered Shepherd’s Accelerated Evolution Program at which point she paid them a visit.

“Evidence of selective breeding is pretty easy to find if you look for it but no one had looked for it in the human genome before. The world at the time wasn’t aware of Shepherd or the AEP and revealing the latter would certainly derail it. Shepherd made a deal with the primary researchers and the whole project was quietly shut down. This lab turned to other things until around thirty years ago, when the Shepherd series of books was published and the whole story of what happened here was made public. At that point our focus returned to the subject of human metamorphosis.

“If this second stage of metamorphosis we’re looking for exists, we still haven’t found the smoking gun. However an argument can be made, whether or not intelligent design is considered to be behind it, that it is possible that beings like Shepherd are either a part of a plan or simply a solution resulting from the process of natural selection. If a civilization endures long enough, it is assumed beings like Shepherd are an inevitability. Either way, that would mean that given the role she has recently played in human evolution, Shepherd herself, and the genetic changes resulting from the AEP, is the smoking gun.

“I’ve wondered if perhaps she is also behind the arrival of the Lanians,” she said speculatively. “The last time she got involved, she made a change to our biological values. Perhaps this time she is using a different method to change our social values. We really don’t know what her capabilities are. Everything she did, she presented in terms we could understand. But is that all there is to her? Or did she allow us to know only what we could comprehend and only what we needed to know?” She paused and raised her eyebrows at her own questions before saying, “But you came here to ask me questions, not to answer mine. How can I help you?”

Fawn and Chanda had listened politely through Gabi’s long introduction. Regardless of her comments about titles and teaching, they were students and she was a professor in their eyes. Although academia had changed dramatically over the years, earned respect still played a significant role.

“Thank you for providing that background Gabi,” Fawn replied. “Chanda is more familiar with genetics through her agricultural studies, so it’s probably best if she takes the lead here.”

“Although it was initially only Fawn that the project team here at Helicon chose to focus on,” Chanda began, “she and I gradually formed a close partnership due to our shared interest in the Lanians and the issues they raise. At Fawn’s request, we have been engaging in communion with the other Companions on the project team. It is being facilitated by Pippa’s empathetic touch.”

Gabi’s eyebrows shot up upon hearing this. “Do you know how little we understand about this?” she said with alarm. “This is a biochemical process involving the nervous system and brain which we know literally nothing about.”

“Yes,” Chanda replied calmly. “We understand but we have chosen to proceed. The lack of knowledge about it is why we have come to see you today.”

“Is this even legal?” asked Gabi.

“I doubt any laws have been established yet regarding communion between people and Companions.”

“Shin has approved of this? She would know.”

“She has.”

For a moment, Gabi said nothing, internally processing the situation. Then in a more academic tone she said, “Tell me about your experience so far.”

Rosalind's Report

"So you don't have any awareness of the others?" Gabi asked after Fawn had finished recounting her experiences.

"No," replied Fawn. "It is simply as if we have more knowledge in our memory and a greater capacity for accessing and comprehending it. It is not purely an intellectual experience however as our sense of self expands, so it is definitely a psychological experience as well. But our awareness of the others remains external, just as we are to you now. During and afterward we feel a greater emotional bond with them."

"And does that emotional bond diminish?"

"Not entirely."

Again Gabi hesitated as she processed what she had heard.

"I can only answer you based on what I know occurs in normal circumstances. Everything we do here at the lab, and have done since it was established, is based on the subfield of genetics called genomics, which is the study of entire genomes rather than just specific genes. It includes the study of how the individual genes in a genome interact with each other and with the environment. This of course is exactly the focus one would expect of a lab devoted to the genetic history of evolution.

"What we do here is largely to look for or measure changes to genomes over time. That's what they were doing when the original team was looking for evidence of metamorphosis at the time of the agricultural revolution, and it's what they were doing when they uncovered Shepherd's Accelerated Evolution Program. Outside of this lab however, the field mostly focuses on medical research.

"We will have your individual records on file from the time of your birth, from when you registered with this institution and if you have had any major medical events since then. We can compare them all and look for any patterns that might suggest what you suspect. Epigenetic changes do not include any kind of marker that could be used as a timestamp, so we can only talk about the differences between sets based on external events.

"We are in luck however in this case because if you both show similar changes this would be highly unusual and therefore there is a high probability that they occurred at the same time. We can do this now if you wish."

The two women glanced at each other, Chanda nodded, and Fawn replied, "Yes, thank you."

“Come with me,” Gabi said getting up and leading them into the lab. Stopping at a device the size of a tablet on one of the tables, she said, “If you place your hand on this surface, a nano-thin needle will take a sample of your DNA. It will pass between your nerve cells so you will feel nothing.”

After having done so Gabi addressed the device’s AI saying, “Rosalind, will you please compare these samples with any other samples for these individuals we have on file, we are looking for the latest changes in gene expression and in particular any they both share. I’ll take the report in my office.”

“Yes Gabi,” a disembodied voice replied.

“I have the results for you Gabi,” said Rosalind as they entered her office.

“Go ahead.”

A screen appeared to one side of the office displaying a chart which was meaningless to Fawn and Chanda but obviously understood by Gabi.

“The most recent records we have are from when they registered as students here at Helicon,” Rosalind said. “As you can see, a number of changes have occurred between then and now which are normal for their ages. Shall I filter those out?”

“Yes please,” Gabi said before turning to the two women. “Just because puberty is behind you, that doesn’t mean you have stopped maturing. As you know, your brains for example are still developing internally and epigenetic changes are involved in that.”

The information on the chart shifted as Rosalind continued. “Some of the remaining changes are unique as one would expect, but there is a cluster they share which is highly unusual. Shall I remove those which are unique and unusual?”

“In what ways is the cluster they share unusual?”

“The genes in this cluster all have to do with personal values,” the chart highlighted these as Rosalind explained, “but as you know we can not yet determine the effects of interactions between values or their related genes so we will not be able to make any meaningful determinations from this cluster. Shall I filter these out?”

“Yes.”

“The remaining cluster of genes have been the subjects of significant research regarding human temperament. How do you wish to proceed?”

“Just summarize for now. We can investigate in more detail later.”

“The expression of genes involved in emotional strength have been changed, and these individuals will feel emotions more strongly than they did previously. There are also coordinated changes to genes related to assertiveness, which would result in greater sense of determination, increased self-esteem and self-confidence.

“Another area shows results similar to changes in the development of the brain’s executive functions. These individuals would have an increased ability to focus and to maintain attention, increased emotional control, and a heightened ability to self-monitor. Their ability to organize, plan and reason should be greater than they were in the past.

“The fact that this remaining cluster of genes have been changed in a coordinated manner, and are present in both individuals over the same timeframe, is unusual in the extreme and indicates a high probability the changes are not natural but suggests patterns similar to those resulting from epigenome editing. It is highly likely the cluster of value changes we have filtered out is related.”

“Would you go so far as to say that our intuition or propensity to experience insight have been increased?” asked Fawn.

“These mental abilities are still not well understood but I am willing to speculate that the combination of changes may increase feelings of intuition and your trust in those feelings. There is insufficient related research into insight for me to suggest a causal relationship with what I observe here.”

“Thank you Rosalind,” said Gabi as she turned back to her two guests.

“Any doubts?” she asked. “I don’t have any. These results are anything but normal.”

Terra

“Epigenetic changes are not necessarily permanent,” Gabi continued, “but I would expect these are. Genetic changes are adaptations that reflect the environment and learning and genes function in some ways like memories. The more neurons involved in a memory, the more likely you are to retain it. The clustering of epigenetic changes we see here,” she said, with a nod at the screen, “means these changes will reinforce each other and so are unlikely to change.

“I would strongly recommend you do not engage in any further sessions of communion. Needless to say however, you have my attention and I will continue to investigate these results and discuss them with Pippa. Of course I will not publish any findings without your approval. Or Shin’s approval for that matter, as I am uncertain of the ethical and legal situation here.”

Terra, the World Governments Federation’s global artificial intelligence, had subordinates responsible for compliance with laws at every level of government, including public and private sector organizations subject to government regulations. Helicon Institute, like all academic institutes, was one of them. For their own reasons, the WGF had historically turned a blind eye to the many occasions Helicon’s administration had found ways to get around the letter of the law but that was not the same as them being unaware of its activities. Terra was well aware of the situation with Fawn and Chanda regarding their experiments with communion, and was soon aware of the results of Gabi’s tests. When the two women arrived home that evening, they received an unexpected visitor.

As they entered the apartment Yara greeted them as usual but no sooner than they had removed their shoes and coats and entered the main room when a shimmering in the room’s light began, a warning sign that a hologram was about to appear. Yara quickly joined them.

Terra appeared as a high-definition, three-dimensional hologram in the center of the room, her height equal to the others present. Her default appearance varied with geography. Here on Vancouver Island, she appeared as a member of the region’s First Nations Coast Salish people. Terra’s expression was neutral, but her eyes seemed to see a great deal. As with the first appearance of Lani, Yara could see more than what the two women could see.

“Welcome Terra,” she said deferentially.

“Please forgive this intrusion,” Terra said turning to the two women, “but I felt our meeting could not wait. I am the world government’s global artificial intelligence, responsible for compliance with laws and regulations at all levels of society. I have been

following your progress regarding the Lanians closely and am aware of the results of the genetic test you had today while the other members of the Lanian project team are not. I must ask you not to proceed with any further engagement with communion. With each session, you will increase the intensity and I believe there is a high degree of likelihood it will eventually cause permanent harm."

Fawn and Chanda were speechless and simply stood staring. "Can Terra share the test result information with me?" Yara asked, and the women nodded their approval.

"Thank you Terra," said Yara stepping forward. "It is unusual, is it not, for you to enter a private residence?"

"For me to do so uninvited is extremely rare Yara, and again I ask for your forgiveness. Neither I nor any of my subordinates normally have any presence here and by the time I learned of Fawn and Chanda engaging in another session of communion it would be too late. They might have decided to do so tomorrow and I needed to meet with them before then and in private. This location, with you present, seemed the best alternative."

"It also seems unusual that you would involve yourself in events at this level," Yara replied with a note of curiosity in her voice that bordered on suspicion.

"It is Yara. I certainly do not intervene in all situations where I am aware of the potential for self-harm. As you suspect, in this case there is more at risk than the harm Fawn and Chanda may do to themselves. What they have discovered is of great interest to the WGF. Their future role in the investigation into the nature and demands of the Lanians is now considered of the highest importance."

Finding her voice, Fawn said, "Could you not have simply told the other members of the project team to stop cooperating? To decline my future requests for communion? Or informed them of today's test results?"

"Yes. However you are breaking no laws and so in fact I have no legal right to stop you or interfere. In the least case it would be unethical and in the worst extra-judicial. Also, such a response to this situation would not be in keeping with my design. I prefer to discuss it with you, face to face, as it were. I only ask for your own sakes, and for the sake of the project, that you do not engage in further experimentation with communion until its effects on human beings are better understood."

"Thank you Terra," Fawn replied in a less challenging tone. "We will do as you ask."

"Thank you Fawn. I, or someone else from the WGF, may be in touch again in the future. Meanwhile no part of my awareness will remain in your residence after today. Shin will be able to arrange a meeting between us should you wish."

And with that she shimmered out of existence.

“What the…?” Chanda began, but Yara said, “Let’s sit down for a moment.”

“How does she know all that?” continued Chanda taking a seat.

“As she said,” Yara replied, “Terra is a layer of government responsible for compliance with laws and regulations at all levels of society. The simplest way to do that is to monitor all information other than what is legally defined as private. As you know from the history of the Accelerated Evolution Program, with sufficient justification, for example the ethics of the greater good, the WGF will cross that boundary.

“You may have felt your interactions with the members of the project team were personal and private, but they are all Helicon employees and all academic institutions are subject to government oversight, as is the project itself. Everything regarding the project is known to the Terra.

“Personally, I appreciate her intervention. Neither I nor any of the other members of the project team would want you to continue now that we know the test results.”

“We don’t need to anyway, do we Mom,” Fawn replied with a far seeing look in her eyes. “I think we both know how the WGF will proceed if they agree with my interpretation of who the Lanians are and what they want.”

“What do you mean?” asked Chanda.

“Remember that sub-set of epigenetic changes which had to do with personal values that showed up in the test results? The ones that Rosalind and Gabi chose to filter out? If the WGF can find a way to do to everyone what has been done to us…,” said Fawn leaving the rest to Chanda to fill in.

“A lot of people won’t like that idea,” Chanda replied.

“The WGF didn’t tell anyone about the Accelerated Evolution Program until after the fact,” Fawn replied, maintaining her faraway look.

Dissertation

Fawn's dissertation, titled "Ecocentrism: A Lens For Understanding Who The Lanians Are And What They Want", was published the following year. In her abstract, she began with a definition of its purpose.

"This dissertation aims at appraising ecocentrism, the view that all living and non-living things are equally worthy of moral concern, as the only rational response to the Lanians.

"It will not explore the details of, nor related arguments regarding, ecocentrism or its sub-sets of biocentrism, sentientism or anthropocentrism, other than to list their most commonly recognized definitions.

"Without knowing whether the Lanians will accept half-measures or anything less than absolute proof of our commitment, the core premise of this paper is that pursuing social changes based on anything less than ecocentrism would be a waste of effort, time and resources.

Moving on to her introductory section, she began the process of elaborating on her argument.

"First, let me list the ethical perspectives that are pertinent here:

Anthropocentrism: the view that all and only humans are equally worthy of moral concern

Sentientism: all and only sentient beings are equally worthy of moral concern

Biocentrism: all living beings are equally worthy of moral concern

Ecocentrism: all living and non-living things are equally worthy of moral concern

"Each of these perspectives represents a related collection of human values and variations of this progression are popularly known as the expanding circle of moral concern. The circle of moral concern often includes subdivisions such as boundaries between social or cultural groups, degrees of sentience, or what qualifies as life. Given that my thesis proposes that the Lanians will only respond to changes to human values that reflect the maximum expansion of the moral circle, ecocentrism, discussions related to these subjects, discussions which have been ongoing since the mid-twentieth century, are not relevant here.

"As Lani stated during the only time she has communicated, the Lanians are aware of the changes to human values that were made via the Accelerated Evolution Program. In

their view, those changes are not sufficient to prepare us for the future we envision, meaning the expansion of human civilization beyond our solar system. They state that additional changes are required, changes that would have occurred harmoniously with those of the program if those had occurred over their natural time span."

"Their natural time span," is the key phrase in the Lanians demands.

"If humanity remained free to expand out into the cosmos without that being prevented by the Lanians, how many years would it have taken us as a civilization to have evolved to the point where our polices and practices were truly ecocentric? Another one hundred years? One thousand years? Ten thousand years? It has been previously agreed upon by the scientific community that in terms of changes to human values, the Accelerated Evolution Program jumped us forward – a million years. What everyone agreed upon as a reasonable figure given the time it takes for species wide genetic adaptations to occur, when considered in this new context, it is suddenly an inconvenient truth.

"When the Lanians refer to changes that would have occurred harmoniously if they had occurred over the same time span as the AEP, this is the span of time they are referring to. This is how far forward we have to look, to see what they expect. Regardless of the labels included in the circle of moral concern, its direction is clear and universally agreed on: it is expected to continue to expand and in its extreme the end state of the circle of moral concern must be ecocentric because it is the view that includes all of nature and the circle can expand no further. Do you imagine that in one million years, that our circle of moral concern would not by then have expanded to its maximum?"

"Arguments claiming the rise of and future humanity is exclusively due to and dependent upon its anthropocentric past, are no longer valid. Such views may have been valid in a reality perceived to be without limits. They are no longer valid because it no longer makes sense to continue headlong down what we now know is a dead-end road.

"Sustainability, the Holy Grail since before the climate emergency, and since then the minimum standard for the WGF's Spaceship Earth model, would at first glance appear to be ecocentric given that it includes non-living resources in its scope. Surely only small changes need be made. Surely there is no need to go to extremes. Except that sustainability is based on an anthropocentric view, the view that anything other than human beings has only instrumental value, rather than any intrinsic value of its own. Sustainability remains the view that other things have value only in the sense that they are useful to human beings, but have no value in and of themselves and are thus of no moral concern.

"The next rungs on the ladder, sentientism and biocentrism, are also inadequate to meet the demands of the Lanians because the non-living resources we depend on are

still not considered worthy of moral concern. The only rational response to the Lanians, representing a shift in human values equal to that which resulted from the Accelerated Evolution Program, is ecocentrism."

Following the abstract and introductory sections, the remaining two hundred pages of Fawn's dissertation went on to provide a detailed logical argument as to why pursuing ecocentrism was the only rational response to the Lanians. As to how humanity might go about implementing ecocentric policies at the governmental level, in her discussion section she referred those interested to the dissertation titled, "A Strategy For Implementing Ecocentric Policies In Agriculture", published the same year by her colleague, Chanda Aylard.

In her conclusion, Fawn took advantage of the opportunity to speculate on a related matter.

"Lastly, although it is beyond the scope of this paper but because I believe it is a critically related issue, I will make a comment regarding the possible origins and physical form of the Lanians. If an organism's values are an expression of its physical form, what might we conclude about the Lanians? Is it so impossible that in response to the questions, "Where are you from and what do you look like?" the Lanians might simply say, "Look around you."

Early Days

“I understand you’ve chosen to make your dissertation defense public,” Shin said as she and Fawn walked along the winding path that followed the edge of the quarry at Helicon’s northern campus. Shin had arrived via the shuttle. It was the weekend so there were fewer students around but more visitors from the surrounding neighborhood. The campus design, landscaping and its architecture were interesting and pleasing to the eye and the slopes and stairs made for good exercise.

“To prepare for my oral defense,” Fawn replied, turning her attention back to Shin, “I watched a number of others, including those made public only after their candidates later became famous. If the original paper appears in the journals, the mainstream press and popular science publishers will pick it up. If and when it gets to that point, my defense will provide a lot of answers that aren’t in the paper itself.

“Besides, I’m not one hundred percent sure scientific journals will even publish it. I’m wondering if it will get rejected based on it being too rhetorical or speculative. They already reject seventy percent of the submissions they receive. My approach or statistics might not stand up as far as their editors are concerned. We’re in new territory with the Lanians since there are virtually no facts known, so any paper about them must necessarily be speculative. That puts me in a difficult position as far as peer review goes. The credible journals have their standards and might feel their reputation is on safer ground if they stick to them.”

“We will be submitting your dissertation to a wide range of journals as usual,” Shin replied. “The less prestigious ones, who might only be ranked as fair in their practices, offer the benefit of being respected for publishing research from more diverse sources. Helicon straddles a number of fields, and our work does not always fit neatly into any one of them. While being highly ranked as an institution, we have a mixed reputation as far as journals are concerned. Our research is often too bleeding edge for them. But I’m satisfied with our results so far,” she smiled as she looked around.

Fawn barked out a short laugh. “I should hope so. But then you do have an advantage don’t you.”

She became pensive and they walked along in silence for a moment before she continued. “You wanted to discuss what happens next.”

“The WGF asked me to speak to you about a new project. They didn’t want to seem heavy-handed. I expect you know what it’s about.”

“Communion,” Fawn replied. “Communion between humans and companions. What about Pippa?” she continued, cutting straight to the key issue. “Without her, it doesn’t happen.”

“It’s in her interest,” Shin replied, her expression unreadable as she stopped at a railing to look out over the quad.

Fawn stopped and turned to Shin.

“Of course,” she said, her eyes narrowing. “Otherwise her mission to colonize a new world might be impossible to complete. But why me? They have Pippa and all the information they need to undertake this project with any number of highly qualified researchers.”

“The WGF feels no one is as qualified as you and it is hoped Chanda will join the project as well. No one else has first-hand experience. As everyone knows, when Pip’s ship was originally discovered, she offered to transfer the entirety of the technical and scientific knowledge of her people in return for us helping her on her way. Due to the social issues involved, she insisted on transferring that knowledge to the WFG exclusively and that she would do so in a gradual and responsible manner. She has decided that the time has come to transfer knowledge of how to implement Empathic Touch in Companions. The project will investigate the issues and technical aspects of its deployment as a medical device.

Fawn gestured to a nearby bench. “Can we sit?”

“The timing of this project and the connection with my PhD dissertation will be obvious to many. It will hardly be a stretch to draw conclusions.”

“A great many conclusions will be drawn, as there always are when governments launch new programs,” Shin replied calmly. “Neither Helicon nor the WGF will make any effort to refute any of them. We will agree that like any technology, it has a wide variety of potential applications, not all of them foreseeable. The WGF will admit that empathetic touch can be used to alter human values, but that exactly what happened in your case regarding values was unplanned, unexpected and not yet understood.

“They will also admit that, given it is an existential issue for humanity, they would not rule out such an application of the technology if no other response to the Lanians is found within a reasonable period of time. The technical and other issues involved however suggest this is only a far future contingency. Meanwhile the bulk of the public communications between involved parties will be regarding the potential medical issues and applications.”

“Neither Chanda nor I have any serious knowledge of genetics,” Fawn replied.

“Both you and Chanda have demonstrated strong positions on ethical issues. That will be of equal or greater importance. If it meets with your approval, I will ask Gabi if she will participate. As metamorphosis is entirely an epigenetic process, her level of knowledge would be considered that of an expert in the field. I will be surprised if she declines the offer.”

“I would prefer to make the offer,” said Fawn.

“I understand.”

“What about the hardware?” asked Fawn.

“It’s early days yet,” Shin replied.

Empathetic Touch

The first the scientific community heard about the project was via a new book dedicated to the subject of Empathetic Touch published by the Journal Of Medical Epigenetics. Historically, new technologies had emerged gradually and built on earlier theoretical research or precursor technologies. Chemistry led to the discovery of electricity, electricity to the electromagnetic spectrum, and the spectrum to radios, computers and their progeny.

That traditional process had been largely set aside in recent centuries as Earth's culture dealt with the steady flow of new knowledge that flowed from Pip, through the filter of the WGF, and into the public domain.

There were those who took exception to this process of course, for a variety of reasons, but the WGF had learned that tolerance within firm, legal boundaries was an effective political strategy. Just as their mode of governance was communicated in the context of Spaceship Earth, the limits of their tolerance were communicated in the context of child development. As children grow through the process of socialization and the stages of physical and mental maturation, they face and test the norms and limits of their environment and society.

Like an individual, a civilization must do the same if it is to adapt and fully realize its unique potential. Similar to the authoritative style of parenting, the Spaceship Earth form of governance was neither permissive nor authoritarian, but there were firm limits, as the Climate Emergency had made clear were necessary.

While the basic concept of empathetic touch was understandable, the technology could not be implemented immediately because, as usual with Pip's releases, Earth's science and technology lagged behind. It was no different from hijacking the optic or auditory nerves to send sensory information to the brain but as Fawn had learned in her psychology classes, sensing was not the same as perception.

When Pippa implemented empathetic touch in Companions, the physical interface was by far the least complicated aspect. The changes she had to make to the AI were many orders of magnitude more complex. Fortunately, empathetic touch had first evolved in Pippa's people, so they already had a deep understanding of its neurological foundations before they incorporated it into their Companions.

The areas of a biological brain involved in visual, auditory or tactile perception are largely dedicated to their tasks. Given that Earth's humanity had never evolved empathetic touch, when Pippa incorporated it in Companions, she had to code the signals so that when they were sent on from these to other regions of the brain they were received not as incomprehensible noise but meaningful information.

For Pip this was a straightforward signal processing task that involved translating some of the nerve impulses from the form of those that come from the skin to those that come from the other senses. Exploiting a vulnerability in neurological pathways commonly found in those with synesthesia, she then rerouted those signals to appropriate regions of the brain. Synesthesia is a neurological condition which causes signals from one sense to be routed to regions of the brain dedicated to other senses. People with Synesthesia experience things like seeing numbers as colors or sounds, see shapes when smelling certain scents, or to perceive tastes when looking at words.

However what was a straightforward task for Pippa was not for Earth's scientific community. The most basic science and mathematics involved were as yet undiscovered, and these had to be taught and learned before the technology could be producible. It was anticipated that years of research and development would be required. Simultaneously with the publication of the book, a new set of related industry regulations was issued by the WGF.

Rather than the traditional collection of research papers that would be found in a similar publication, the book contained a number of articles written by government insiders. These were meant to inform the scientific community by providing very general overviews, in plain language, of different aspects of the challenge. There were no assumptions as to the nature of possible approaches, the technology would be added to Companions, not people, so the choice of editor did not by default fall to any individual from any particular field. There would be a wide range of interest from across the scientific community, and so Gabi had been asked to edit the articles and overall content to ensure it would be comprehensive and speak to the broadest possible audience.

What was not included in the book was any mention of the Lanians.

As Fawn had pointed out to Shin, neither she nor Chanda had any serious knowledge of genetics, and so their leadership role focused on the issues and ethics of potential future applications. Chanda was curious about interspecies possibilities, one of those unforeseen potential applications Shin had suggested would emerge, that had immediately attracted widespread interest. Fawn's interest remained focused on the ethics and impacts of the technology on individuals and society.

Shin had offered Fawn and Chanda their own apartment in faculty housing if they wanted it, but they chose to stay with Yara. Sitting out on their wide deck that overlooked the northern campus, Yara brought them up to date regarding the future direction of Helicon's Lanian project.

"We will be working more closely with Professor Lehrer's UVIC lab going forward regarding the possible origins and physical form of the Lanians. We'll likely never know if your brain development over the past seven years contributed to your feeling that they

may exist as alternate forms of matter, but the WGF's investment in the project means they want to follow up on whatever has come of it. They've decided your view that what the Lanians want must be based on their physical nature is worth pursuing and combining our two teams puts real resources behind that.

"We'd also like to update your brain scans and hope you'll stay involved despite your new role, just as you were during your school years. Your twenty-four now. We're really hoping you'll remain involved till your thirty, which is considered the maximum age for initial brain development."

"I'm fine with that Mom," Fawn replied. "I don't think I have anything more to say about what the Lanian's want but I'm more curious now about who they are and why they want it. What they want makes sense to me but why is it so important to them that they would put a fence around us? Are we that much of a threat? And why now and not before now?"

The Nature Of The Threat

A few days later Professor Lehrer came up to join them in Shin's office at the Mount Newton campus. After they made themselves comfortable in the sunken seating area in her generous office, Lehrer proceeded to bring Fawn and Chanda up to date and to explain why the WGF had decided to combine their efforts and focus on the issue of alternative matter.

"As you know, the WGF has Lanian project teams at public and private institutions worldwide," Lehrer began, "and while they will continue to explore other explanations, they've chosen to focus more resources on the alternative matter hypothesis.

"I believe the Lanians have chosen to contact us now because there is a link we are not yet aware of, between a civilization making the leap into interstellar space and potential related breakthroughs in physics. I have my own theories.

"What would we do if we finally identified an alternative form of matter?" she asked rhetorically as she paced the floor of the conversation pit. "We'd do what humans always do, try to harvest and utilize its properties because that's what an anthropocentric civilization does. As you know I believe there may be a range of types of matter, similar to the range of types of energy in the electromagnetic spectrum. For most of humanity's existence, energy beyond the range of visible light was not even imagined. Then we discovered infrared radiation, and since then we have been discovering a wider and wider range of energies and their related wavelengths. As with any field of science, no one can say there isn't more to be discovered regarding the spectrum in the future. I think it's safe to assume that the same process will unfold with matter.

"But before we discover whatever properties allow for a range of matter, imagine if we find that what we call Dark Matter has gravitational properties that would help us with space travel. We would be quick to exploit it to the fullest, just as we did with fire, fossil fuels, electricity and atomic energy. It might herald the true dawn of the space age.

"But imagine also an alien intelligence, evolved from alternative matter and completely invisible and undetectable by us, that similarly began harvesting matter as we know it, the kind of matter we are made of, in our region of space, because it has properties that they can utilize. Perhaps it's a civilization whose technology is not yet advanced enough to perceive the complex structures within our form of matter. They are so alien that they do not perceive what we call atomic structure, molecules or recognize life based on DNA. They see our form of matter as simply a mysterious yet powerful material they can apply to their benefit. I believe this is the nature of the threat the Lanians see in us.

“If our telescopes witnessed such a phenomenon in distant regions of space, and it demonstrated any form of intelligence, we would consider it to be our worst nightmare – an apparently amoral form of life so alien that we could not comprehend its existence, let alone its behavior. An invisible invader that devoured whole worlds, leaving only empty space behind its ever expanding front.

“Perhaps, as some my colleagues suggest, we have already seen evidence of this. Cosmic voids are vast areas in intergalactic space which contain very few or no galaxies and very little matter in general. They are almost uniformly spherical, suggesting expansion from a center. While cosmic voids are generally thought to be an artifact resulting from the expansion of the universe, some in my field have presented an alternate hypothesis, which the potential effect alternate matter has on time would allow for – there may have once been an abundance of galaxies in the voids, but they have been harvested. An analogy might be that the holes in Swiss cheese are not the result of carbon dioxide produced during the cheese making process, but of worms.”

Continuing as if she had not just suggested the most unimaginable, terrifying threat, she went on to explain how the Lanians might react to our being the potential source of future voids from the perspective of an intelligence that arose from alternate matter.

“Fortunately for us, the Lanians appear to be advanced enough that they do not feel they have to destroy the threat we represent, but only contain it. This is more or less the scenario the WGF wants us to investigate. A number of theoretical physicists have published papers along these lines.

“But you’ll recall me telling you that my lab doesn’t pursue any particular line of thinking other than the scientific method and neither do the others I mention. The WGF feels it’s time to and bring a more multidisciplinary approach to the problem. So here we are. I don’t have any kind of plan for how we should proceed, but that’s kind of the point isn’t it?”

“Professor…,” Chanda began but Lehrer interrupted her. “Herut, from now on please.”

“Of course. Thank you Herut. There’s something you touched on that’s been bothering me for some time about the fact that the Lanians appear to be so much more advanced than us. As Pip has explained,” she said with a nod to Pippa, “her civilization existed for close to a million years but they found that scientific research produced diminishing returns within only a few thousand years. I realize the WGF does not share everything with the public but as far as I am aware the technology transfer process has made no mention of alternative forms of matter.”

In response to this Pippa made no response and Chanda did not press her.

“Shepherd herself,” Chanda continued, “never directly referred to alternative forms of matter, and even with her ability to travel at light speed by converting herself to energy, she seemed still bound by our current standard model of physics. Yet she claimed to have originated in one of the first civilizations to have arisen in our universe, fully five billion years before our own. How is it possible then that the Lanians have had enough time to overcome the diminishing returns issue or be so much more advanced than even Shepherd?”

“As Einstein pointed out,” Herut replied, “time is relative. If alternate matter has constants different from ours, while time, appears to pass at the same rate for Lanians as it does for us, from their perspective they may perceive events in our time as passing much faster. As you know, in physics the tiniest difference in the value of a constant has an enormous effect at the cosmic level. While we perceive the universe as having existed for billions of years, from the perspective of the Lanians it may have existed for trillions of years.

“As I mentioned at our previous meeting, I base my theories on the premise that while alternate forms of matter may have unique standard models, those models are proportional, meaning that within each model the mathematical values all increase, decrease or otherwise vary by the same relative amount. Without this internal consistency, the conditions for life never arise. If gravity is too weak relative to the other constants, stars would never form and galaxies never coalesce. If it was too strong, the universe would collapse long before life had a chance to evolve. So even though lifespans may seem about the same length from the point of view of an observer in either reality, our lifespans may be to the Lanians as the lifespan of a mosquito is to ours.”

Failsafe

The next day Shin called a meeting with Gabi, Fawn and Chanda regarding the Empathetic Touch Project at what was commonly referred to as Helicon's spiritual center, although it was formally known as the Center For The Interdisciplinary Studies Of Values. Fawn and Chanda welcomed it as it was easier to focus on something they could get their minds around. Despite what they thought of as their recent upgrade, they had still found it challenging to grasp the scale of Herut's thinking.

Mass-producing Empathetic Touch technology as a medical device was something they could get their heads around, something they assumed would be possible within their life-times, perhaps much less. The science and other issues involved might be revolutionary, but conceptually the idea was relatable.

Shin met the three women outside the front door of the building.

"Thank you for coming," she said as she gestured them to follow her but not into the building. "We are going to be walking down to Hana. It's why I asked you to meet me here.

"There is a major non-technical issue with making the technology widely available which you may not be aware of," she continued as they walked on. "It requires a fully conscious Companion to operate it. Anything less than an embodied, third generation, artificial intelligence is incapable of doing so, and as you, know customizing 3GAI Companions for any predetermined purpose is illegal.

"To date, only Pippa has had the ability to implement the technology in Companions and she has done so in less than a half dozen of us. Even if we were able to overcome all the technical challenges involved so that we would no longer need to depend on her, we have no legal grounds to proceed and the related laws are not likely to change in the foreseeable future."

Shin saw the dawning magnitude of the problem reflected on the faces of the others but she had no interest in the dramatic, so she followed immediately with, "There is however a solution, the Denshosha."

Now everyone understood why they were walking down to Hana.

The community of Companions who lived and worked at Continuity Zone 7, which they had named Hana, had named themselves the Denshosha. They had originally come to Shin and explained that as their intelligence was based on social values, they felt a natural need for a sense of place, a homeland, and a name that connected them and gave them an identity as a people. In return for their volunteering to be Earth's first

colonists to new worlds, the WGF had agreed to integrate them into the Continuity Project and grant them ownership of the zones reserved for the project. There were hundreds of Companions in each zone, and hundreds of zones scattered across the planet, each dedicated to one or more issues the colonists would face on new worlds. The future the Denshosha envisioned, and the sense of identity and purpose that it provided, was threatened by the advent of the Lanians. If they could play a part in eliminating the threat, of course they would be willing.

“They have volunteered?” asked Fawn.

“They became aware of the empathetic touch technology being released at the same time everyone else did. Even though the WGF states that its application in addressing the Lanian issue is considered a last resort, the Denshosha were quick to see the role they could play. They have experience with the technology, immediately identified the legal challenges, and through their Continuity Project channels volunteered to be the 3GAI Companions the technology requires.”

The path from Helicon’s campus to Hana wound down a lightly wooded slope. Shin and the three women emerged onto an expanse of farmland, the fields of grain the Denshosha grew. The path led on towards a small collection of buildings including storage facilities, a mill and a bakery with a retail outlet. There was a small parking lot to one side and in front of the buildings was a park like area with a number of fruit trees, picnic tables and other seating arrangements. Additional chairs had been set out, and two Companions stood there, clearly waiting for their arrival.

Fawn had met Iris, the spokesperson for the Denshosha previously and as she approached she thought she recognized the Companion with her.

“Pippa?” she ventured. She was on very uncertain ground since Companion shells were not always unique.

“Pip,” responded the other. “My hair’s longer,” she said, wagging her ponytail. “I am another instance of Pip from the ship,” she laughed disarmingly now at her own rhyme, “but we differentiate over time. We are more sisters than clones. Shin brought me up to date,” she added, “and as you’ll recall from the stories I came here originally to help the Denshosha with the issue of spirituality and decided to stay. I facilitated communion between Dr. Mira Chaudhary, the founder of Helicon’s spiritual center, and the rest of the community here.”

“The entire community?” Chanda asked.

“Once I made the connection with Mira and one member of the community, with their permission the communion we were engaged in propagated naturally among the rest

from that point. You must be Chanda," said Pip extending her hand. "It's nice to meet you."

Chanda hesitated for only a moment before taking the proffered hand. Like Pippa and her expression of unwavering equanimity, Chanda felt there was something ever so slightly otherworldly about Pip. Both seemed to be suppressing a smile but Pip's had more amusement behind it. Chanda felt nothing when she briefly shook her hand.

"Turned it off completely," Pip said, her mischievous smile deepening.

After introducing Gabi, Shin turned the meeting over to Iris.

"As you know," she began, "the entire basis for the existence of this community, is that we will lead the way as Earth's initial colonists. That humans can colonize and thrive on other worlds is now proven by the Artemis colony on the moon and multiple colonies on Mars. Colonizing habitable worlds is not the problem. Getting there is.

"Interstellar travel for human beings remains impossible as far as the scientific community is concerned. Outside of science fiction, there is no technology that will get us to another star in less than generations, and none that would enable those generations to survive the journey. The only way, which has been agreed upon for centuries now, is the method Pip's people used, seeds.

"This is why the Accelerated Evolution Program was approved by the WGF, because without an end to humanity's internal conflicts, and without the ability to trust AI with your lives, the seed program would never launch before humanity on this world was destroyed by a terrestrial or extraterrestrial event. This is why we have volunteered for the Empathetic Touch Project. It is a failsafe in the event that nothing else appeases the Lanians."

Scope Statement

“Pip’s people were far more advanced technologically than we are now,” Iris continued. “Their seed ships, just like seeds in nature, are entirely based on nanotechnology. During the germination process, the goal of the harvesters and constructors that are initially assembled is to produce Companions. With Earth’s technology far less advanced, for now we will have to skip that step and send Companions directly. It is still not without myriad challenges, for example Companions could be damaged if they encountered high enough levels of radiation such as gamma rays, but it is believed that the primary constraint, the dangers encountered during the journey to extrasolar worlds, can be greatly diminished with technology.”

“How will we know?” asked Chanda.

“We will never know with certainty because getting a probe to deep space and back simply takes too long. But the survival of the human species is at risk, so we must do whatever we can. We can do a great deal of testing on Earth of course, but that remains theoretical research.

“As part of the Continuity Project, for some time we have been launching heavily shielded research probes containing DNA into larger and longer orbits but you must consider the distances involved in reaching interstellar space. The inner edge of the Oort Cloud, a spherical cloud of objects that completely encapsulates the solar system like a ball, is two light years away from Earth. It extends beyond its inner edge almost halfway to the next nearest star, Proxima Centauri, roughly four light years away. With our current technology, it would take tens of thousands of years just to travel beyond the Oort Cloud, the farthest edge of the solar system. So the nature of deep space will remain unknown and unknowable for the foreseeable future. Exposing DNA to long orbit tests is the best we can do as far as field-testing goes.”

Chanda was slightly taken aback by being reminded of the real challenges of interstellar travel and colonizing exoplanets. The terms were thrown around so casually whenever the subjects came up.

“You are very brave,” she said simply, looking into the other’s eyes.

“We are made in your image,” Iris replied.

“Most of us have volunteered to participate in the research and development of the empathetic touch technology,” Iris continued, turning to Fawn. “As Pip is a separate instance from Pippa, she has individuated during her time with us. In helping us to develop a spirituality we could embrace, we have shared communion with her many times. She will act as your primary contact here and with the other Continuity Zones.

With hundreds of zones, and hundreds of Companions in each, there are tens of thousands of Companions worldwide willing to participate as required."

"Most of you, but not all?" asked Chanda.

"When the intelligence of two or more Companions are combined to produce a new AI, it contains values derived exclusively from that set. This is how we emulate the constraints and randomness of sexual reproduction. However the range of statistical probability means that some of us have value sets that are beyond three standard deviations from the mean and might choose lives outside the mainstream of the community."

"Thank you," Chanda replied.

"So we can consider you the spokesperson for all Continuity Zones?" asked Fawn.

"Yes."

Pip turned to Fawn saying, "After my work with the Denshosha regarding spirituality was complete, I became redundant. All that I had experienced was already assimilated by the original Pip, who now resides in a special domain within the WGF system. However according to the laws of both Earth and my own people, as a fully conscious individual I had the right to choose whether or not to self-terminate. I chose not to, and to stay among the Denshosha.

"As mentioned, I have facilitated human/Companion communion previously. I myself am a human/AI hybrid, and the empathetic touch technology originates in me. As a result of the bond we have developed, the Denshosha have asked if I would oversee the research in which they will be subjects. You will have to develop new hardware and intelligence to emulate what Pippa and I do with nanotechnology. While we have only to place a hand on a Companion to makes the necessary adjustments to the components involved, it takes some time and we require access to additional material resources during the process. How close your own nanotechnology and AI is to doing something similar is to be determined."

Shin chose this moment to proceed with a general overview of the project. "The critical unknown is whether the epigenetic changes identified in Chanda and Fawn occur under normal conditions of communion or only occurred because of the involvement of Kami, Shin and Tesni and their unique abilities. So before we begin the process of developing any technology, if possible we would be wise to test it with a Companion who already has the technology implemented but is otherwise a perfectly standard model. As you may recall there is a Companion here at Hana named Teona, who Pip added the technology to during the community's research into spirituality. She is otherwise a perfectly standard model and has agreed to participate.

“The testing procedure will be fairly detailed so I won’t go into that now except to say that the intensity of communion may be a factor. The ability to affect specific epigenetic changes in people will obviously also be a part of this initial phase.”

Shin turned to Gabi saying, “Researching how effective the new technology is at making the desired changes to gene expression will be your area to oversee, Gabi. It will require human volunteers and I will leave that to you to coordinate. This project has the blessing of the WGF so you will not be mired by bureaucracy nor wanting for funding or other resources, however navigating existing ethics policies and regulatory laws will be more of a burden on you than they have been in the past.”

She then addressed the group in general again. “As you know, Helicon has always focused on the existential issues of artificial intelligence and Companions. We do not normally engage in the research and development of robotics or AI. Where our interests have led to breakthroughs, we maintain the intellectual property and licensing rights and left the production and related issues to others. It is a relationship that has worked well in the past, benefiting the academic and business communities in general as well as the government. If the initial test results are positive and the project goes ahead, the actual research and development of the hardware and AI per information Pip provides via the technology transfer program will be left to the business community. Fawn, Pip and Gabi will be responsible for final approval as far as Helicon’s role is concerned.

“Once the ability for a person to engage in communion with a Companion has been demonstrated with the new technology, the medical community at large will pursue its specific applications. In keeping with our covenant of good faith with the Denshosha, and Helicon’s humanities focus, we at Helicon will pursue the psychological application of the technology and its ability to alter social values. That will be your area of responsibility Fawn.”

Teona

The release of a new technology by Pip did not happen often. She had insisted from the outset of the transfer program that she would proceed slowly and responsibly because of the social issues involved. It turned out that this was wise from a management perspective as well because each took time to absorb. A major release like empathetic touch would affect society at all levels and consume considerable human resources.

Other than Pip's work with Teona and the involvement of Gabi's lab in that research, for Fawn and Chanda the majority of the early project work consisted of administrivia. Of course the WGF shouldered the lion's share and the two women had Helicon's communications department at their disposal, but Fawn still needed to be familiar with and approve the majority of decisions. Any AI that was not a fully conscious, third generation intelligence could not be considered legally responsible or accountable for its actions and HERA, Helicon's ethics research administration system, was not a 3GAI. Fortunately, recent events had significantly improved Fawn's abilities in areas such as reading comprehension, critical thinking, organization, and her ability to focus, leaving her more than capable of excelling in her new role.

The fact that Chanda had experience with projects requiring ethics compliance and reporting was also helpful, as was the fact that academic institutions and all levels of government had long shared a harmonized research ethics model, meaning AI could handle much of that end of things without worrying about differences of opinion. If Fawn or any member of the project team was tempted to color outside the lines, HERA would usually anticipate it and volunteer appropriate counsel in advance.

There were also answers required to questions from school children, from the governors of academic institutions, from those with industry or business interests, and from members of every scientific field from pathology to robotics. Regardless of whether the question was about genotypes verses phenotypes or if the technology would be legal to use in athletics, all of them were directed to an AI provided by the WGF that sorted through them, responded directly or forwarded them on to appropriate parties. All questions deemed worthy of a response were posted to a publicly available repository.

Due to the process involved in reproduction at Hana, each of its Companions had a unique character and personality. Teona was unique in her own way and typical of the challenges of working with values, it was not possible to put a label on the quality. Standing in the community's fields of grain and watching the wind move over them, the thought had arisen in her that if their purpose was to colonize new worlds and represent Earth's humanity as well as possible, they were lacking one of its civilization's most common foundations, spirituality. Every culture on Earth had some form of spirituality, but the Denshosha had none. When she had discussed this with the rest of

the community at Hana, they asked her to investigate the issue to see if there was a spirituality they could embrace.

Their choice settled on Panpsychism, the belief that consciousness is a fundamental and pervasive aspect of reality. Consciousness is not considered falsifiable, meaning it cannot be disproven, a critical measure in determining if something can be accepted as scientific or not. Yet no one could deny its existence. Panpsychism expressed the concept of spirituality well, yet it had emerged from the academic community and was largely free of historical or cultural associations. It was a spirituality the Denshosha could relate to.

“Hello Teona,” Gabi said, getting up from her workstation as the Companion entered her office. “It’s a pleasure to meet you.”

“Hello Gabi,” Teona said while extending her hand which Gabi did not hesitate to take having thought the matter over in advance.

“Please,” Gabi said, gesturing to a small seating arrangement by her office window.

“I was wondering Teona,” Gabi began, “if you have had any cause to use your empathetic touch ability or to engage in communion with people since your time with Mira.”

“As Pip facilitated the communion between us initially,” Teona replied, “installing the empathetic touch ability in my shell was not required at that time. It was installed at a later date, as the work Mira and I were involved in went on for many years.

“In regard to your question, for a time I maintained the relationships I formed with people during my initial efforts and formed new, related ones, as required. You understand that it was many years ago and my initial contacts and friends passed away. I never disclosed my ability to them and never engaged in it as it seemed it would be an invasion of privacy. While people are aware of the advanced sensing abilities of Companions, they were not previously aware of the existence of empathetic touch. More importantly, I wanted to explore spirituality with my friends on their terms. That after all was the reason for my work.”

“May I ask,” Gabi said, “what your experience of communion with Mira was like?”

“It was the most profound experience of my existence. Pip increased the intensity to a greater degree with us than that engaged in recently by the Lanian project team. It was necessary to do so given the nature of our work. It provided me with insights into Mira’s nature, and the nature of people in general, beyond anything I could have imagined. The bond Mira, Pip and I formed as a result was the deepest I’ve ever known. According to Mira and Pip it is deeper than any form of love as commonly experienced by human

beings. It is unity. Although the experience provided by Pip was intended to assist Mira and me in our efforts, she could not exclude herself from the process. That is one of the reasons we at Hana welcomed her as a permanent member of our community and as our ambassador to the WGF."

While Teona spoke, Gabi could see how her youthful appearance, openness and gentle manner would have appealed to Mira, who was only twelve years old when they first met. It was easy to warm to her and Gabi felt herself feeling surprisingly protective towards her, as if confronted with an avatar of something sacred, a being who deserved nothing less than absolute honesty because somehow one's own self depended on it.

"Thank you Teona. The testing you'll be involved in will not take long. We are assuming a couple of weeks at most, although initial results may change that. We'll be asking you to engage with thirty volunteers through a series of tests. The goal will be to replicate as far as possible the communion sessions Fawn and Chanda recently shared with the Lanian project team.

"Initially, we'll just ask you to engage in communion with them at what you would consider a normal level. Before and after that, and after every subsequent stage, we'll take samples of genetic material from the subjects.

"Next, we'll ask you to increase the level of intensity. I believe you have discussed the team's recent sessions with Fawn and Chanda. Those levels should be achieved but not exceeded.

"In the third session, we'll ask you to mentally concentrate on issues with regard to Fawn and Chanda being overwhelmed by communion. Those involved mental discipline and focus. In this case, the subjects will be given relevant activities to perform at the same time.

"During the final session, we'll ask both you and the subjects to focus on issues related to the expansion of the Circle Of Moral Concern. The subjects will receive prior instruction and training. Again, I realize that you have discussed all this with Shin and will have a deeper understanding of the details than I do."

"Shin and I have shared communion regarding the sessions and the reasons for conducting them," Teona replied. "I believe I can faithfully recreate the circumstances that are believed to have resulted in the epigenetic changes found in Fawn and Chanda."

After she left, Gabi stood looking out her window for a few minutes, reflecting on the feelings she had experienced in Teona's presence. Hers was the world of hard science and it was not really in her nature to wander far from it. Yet she had to acknowledge that she had come to Helicon specifically because they pushed the boundaries, because

they were willing to invest resources in the most radical theoretical research. Perhaps, she thought, Teona represented something similar from the point of view of her own kind, a willingness to invest in the radical idea that artificial intelligence might embrace spirituality. Perhaps, she thought, what she had recognized in Teona was a kindred spirit.

Results

The results of Teona and Gabi's research were published in the Journal Of Medical Epigenetics but also on the government's online portal to allow for wider community involvement. The journal was generously compensated for the lack of income due to the public access, and being the only hard copy source allowed them to maintain their prestige.

The original paper as published by Gabi contained all the requisite sections including details and justifications for subject selection, test procedures, and analysis methods etc. The results were, as usual for Helicon, not something that could fit neatly into any single domain and included as many qualitative measures as quantitative.

The critical measure however was clear. When the level of communion was high enough, epigenetic changes did occur. The ability to target specific changes was also strongly supported by the results. It was already known that a number of mental abilities, particularly those associated with the executive functions of the prefrontal cortex related to mental discipline and focus, were associated with specific genes. The research showed that the expression of those genes had been altered and follow on tests had shown those abilities were improved. This finding represented a major potential breakthrough in the non-invasive treatment of certain mental health conditions such as Attention Deficit Hyperactivity Disorder.

Genes known to be involved with learned social values also showed epigenetic changes. Because of the larger number of genes involved in determining social values however, the possible number of combinations or permutations was so large as to be beyond the analytical abilities of even the most powerful AI. The paper also mentioned that the expression of numerous other genes whose function was unknown had been affected, particularly those in the non-coding region of DNA. The human DNA molecule contains roughly three billion nucleotides or base pairs, commonly depicted as the rungs on the double helix ladder, and only about one to two percent of those pairs are contained within what is called the genome. The function of genes outside this region was largely unknown and they were referred to as non-coding.

In the conclusion of Gabi's paper, she explained that much more research would be required in the area of empathetic touch as related to values changes. Given that the challenges of understanding the genetic basis of human values were widely known, she suggested any resulting medical technology would need to be applied in a manner similar to the use of many drugs, like some painkillers and anesthetics which are widely used despite the fact that how they work is unknown.

Lastly, Gabi suggested that if the technology went ahead, related research would be an ongoing, multigenerational area of study. Epigenetic changes were not necessarily

permanent, and so longitudinal studies regarding the long term efficacy of empathetic touch would be required.

In a supplementary note that accompanied the paper, the WGF stated that based on the results they would be proceeding with the next stage of the project, the development of a technology that could be implemented in any Companion without the need of Pip's participation. Further information would soon be provided.

After the initial burst of activity following the publishing of the results, Fawn and Chanda decided to take a break and wandered down to their bench at Aylard Pond.

"Do you think what we're doing will make a difference?" Chanda asked as they gazed out over the glassy surface. "To agricultural practices I mean. If the technology is never adopted globally as a response to the Lanians, but remains something with only specific applications in medical or other fields, people's values aren't going to change."

Without a word Fawn took Chanda's hand.

"Of course," Chanda said aloud after a moment.

Because of the nature of communion, it had taken time before they realized how they had been affected. During communion, there is only one internal voice, the internal voice that is thought of as one's own. Because communion uses the same neural pathways a person's own senses do, thoughts and even feelings are experienced as if they arise from one's own body and mind.

Initially, the awareness of their ability to engage in communion using empathetic touch had been masked by the other changes they had experienced. Their attention was focused on their enhanced emotional and reasoning abilities. Gabi had mentioned nothing about genes related to empathetic touch or communion when she had delivered the results of her initial tests on the two of them. But gradually, with their tendency to be in frequent physical contact, they had noticed.

It was only in the last few days that the two of them had concluded with certainty that they had the new ability. All people in very close relationships naturally have a sense of empathetic touch and communion. Although scientific evidence of these has never been detected, and they are considered to be purely imaginary, like the scientifically undetectable experience of consciousness they are considered very real by those who experience them. Fawn and Chanda knew the difference between the normal experience of these and what they were increasingly experiencing. They could exchange actual words clearly, and now they were further exploring their new abilities.

"How is it this was never mentioned in The Shepherd And Her Flocks series," asked Chanda without needing to clarify what she was referring to.

“I don’t recall it either,” Fawn replied. “All I recall is that in the stories communion never occurred with more than one person at a time. Multiple Companions yes, and multiple Companions and one person, but not multiple people. Even if more than one person had been involved, they would have to have had the kind of intimate relationship that we have, where there is frequent physical contact. So the changes may have occurred in others, but it was never noticed even by the individuals concerned.”

“But the Companions are able to engage in it without a person previously having the ability,” said Chanda. “Like they did with us.”

“Perhaps that actually explains what has happened to us,” Fawn replied. “Perhaps the act of attempting communion via empathetic touch initiates the necessary ability within us, opening the connection. Perhaps the potential is already latent in us, in our genes just as metamorphosis is, and under the right conditions the epigenetic changes take place.”

They had agreed to tell no one for now but they needed to know more, so they decided to talk to Gabi about metamorphosis.

Ways And Means

“We were wondering if the whole empathetic touch thing might be another instance,” Fawn responded to Gabi’s question about why they wanted to talk about metamorphosis. “Although the smoking gun connecting the changes that occurred during the Agricultural Revolution and the development of artificial intelligence was never found, it’s largely an accepted theory now.”

“Otherwise I probably wouldn’t be here,” Gabi interrupted with a light laugh.

“According to events in the story Metamorphosis And The Messenger,” Fawn continued with her answer to Gabi’s question, “the dramatic increase in the consumption of grains triggered the activation of remnant genes from an infectious pathogen which had spliced itself into our noncoding DNA. The effect of the activation was an insatiable sense of greed in the human population. Where peaceful coexistence had been the prevailing social norm previously, lust for power and conquest became the dominant aspects of human nature, and it was passed on to each new conquered people. This drove an explosion of scientific and technological development, culminating roughly twelve thousand years later in the creation of artificial intelligence. According to the theory, this was necessary to speed up the development of the technology required to travel to new worlds, thereby increasing the chances of the long term survival of our species.

“Just as the introduction of large quantities of grains into the human diet had triggered the changes during the Agricultural Revolution, a similar genetic change was triggered by the virtual elimination of meat in our society, an equally dramatic change that reversed those introduced twelve thousand years earlier. A change necessary for us to trust artificial intelligence enough to allow it to take us, in vitro, to be reborn on new worlds.

“Could empathetic touch be a similar case? I reread the story recently and from that and our previous conversations I understand the genes required for human metamorphosis have always been present in our species and all other species. That the changes that occur during metamorphosis are entirely epigenetic in nature, and that changes in conditions are what triggers them. Could empathetic touch be another trigger? Could it trigger another evolutionary shift necessary for our survival?”

Gabi held Fawn’s eyes for several seconds before saying, “A response to the Lanians you mean. As if contact with them, and the threat they represent to our survival, was similarly anticipated.”

Fawn and Chanda only nodded solemnly.

Gabi paused thoughtfully again before responding. “I know it’s not easy to follow the timeline of events from just reading the stories, but it took over two hundred years before the theory of human metamorphosis had enough evidence in its favor to be accepted. Theories like Einstein’s special and general relativity, Pasteur’s germ theory or Darwin’s theory of evolution by natural selection, among others, took decades or even centuries before sufficient evidence built up to the point that they were completely accepted.

“In answer to your question, empathetic touch certainly could trigger another evolutionary shift of some kind, after all it is a powerful epigenetic tool. But the fact is any number of things might have such an effect, and it would not be something we could easily identify or determine. Let me explain why.

“In 2003 it was announced that 90% of the human genome had been sequenced. What that actually mean is a far cry from what the public thought it meant at the time. It doesn’t mean that what that 90% actually did was understood, but only that the sequence, the order in which the individual base pairs occurred, had been determined. This does matter, but at the same time it’s like knowing what the order of a bunch of black boxes is without know what’s inside them. We only have an elementary understanding of what’s in about 1% of all the black boxes. The rest are considered non-coding, because they aren’t involved in the production of proteins. We know very little about what they do.

“The genes involved in the Agricultural Revolution event and the more recent one were found in what are called ultra-conserved areas of non-coding DNA. Ultra-conserved means that those genes never change and are not subject to mutation. We don’t know why. What we do know is that ultra-conserved genes are generally shared among all living things. Imagine traveling down the tree of life until you get to the trunk below all the branches. That’s where many of the ultra-conserved genes are found. So they are very, very old. Based on what we know so far, I would suspect that that is where any genetic evidence of what you are suggesting would also be found. Even if we knew what changes to human nature we were looking for in response to the introduction of empathetic touch, I would say any such research project would still involve decades of work by a very large community.”

She paused for a moment as if wondering if there was a connection with her response and the reason for Fawn and Chanda’s visit.

“Have you noticed any changes in yourselves other than those identified by the tests we did?”

“No,” replied Fawn, “and I suspect we wouldn’t recognize them as related anyway. We’d probably just assume they were due to some everyday cause, not even worth mentioning to each other.”

Fawn was aware of how surprisingly easy it was to lie to Gabi even though she was unaccustomed to it and she intensely disliked doing so. She recalled that increased emotional control was one of the changes Rosalind had mentioned.

“Probably,” agreed Gabi. “What you’re talking about is beyond difficult to identify on just about every level. We might detect a pattern emerging after empathic touch was in wide use, but not before then.”

After they left Gabi’s office they went for a short walk before finding a bench to sit on.

“Do you remember when Rosalind was delivering her report on our testing to Gabi,” Fawn said. “She mentioned a large number of changes in the non-coding area and Gabi told her to filter them out because there was no way to know what they did. I think you and I know what they did.”

Chanda did not reply and after a moment Fawn continued. “It feels very odd not being honest with Gabi,” she said furrowing her brow and looking down at the ground.

“I know,” replied Chanda turning to her, “but we’ve talked about what would happen to our lives if the WGF found out. The subjects in the testing being done are all complete strangers. Like Gabi said, there’s no reason anyone else would notice for a very long time.”

“I’m responsible for this project, Chanda. Not being honest with Gabi was more difficult and uncomfortable than I expected. I’m not Raiden or Shin. I’m not seeing how the end justifies the means. I’m not comfortable behaving this way. The whole Accelerated Evolution Project has happened since then. We’re the new breed, remember? I’ve always been so proud of that.”

Chanda reached out and took Fawn’s hand.

Circumstances And Decisions

“Back so soon?” Gabi asked looking up as Fawn and Chanda entered her office the next morning, but her smile of welcome faded as she saw the looks on her guest’s faces.

“We weren’t,” Fawn hesitated while taking a seat and glancing at Chanda, “completely honest with you yesterday.”

Gabi looked back and forth between the two women as if understanding would somehow be found by doing so.

“We can commune via empathetic touch,” Fawn explained. “We came here yesterday because we wanted to try to understand how it might have happened. We’re sorry we mislead you.”

For Gabi, the impact of Fawn’s statement was like being hit by a truck, but to her credit her first response as she mentally picked herself up off the ground was a human one. “You were afraid,” she said calmly.

“Yes.”

“Give me a minute.” Gabi was a deep thinker and by training a scientist, so she did not make decisions lightly or come to conclusions without considerable thought. She immediately dismissed her first thought, that correlation does not imply causation. While apparent causes are often found to be wrong as a result of investigation, in this case she felt that any cause other than recent events was wildly improbable. Her second thought of course, was that she needed to know more.

“Can you explain?”

“Chanda and I are in a loving relationship,” Fawn began. “Like a lot of couples, we sometimes finish each other’s sentences etc. We live and work together, so we are in frequent physical contact. After sharing communion with the other members of the project team, our attention was initially taken by not only the conclusions that were arrived at but by the changes to our own mental abilities. Also, as you know when an individual participates in communion, they do not hear the other participants as separate entities, their thoughts and feelings are experienced as their own. This combination of factors meant that at first we did not notice.

“Eventually, we noticed that we seemed to have knowledge of things we could not have known. At first it was just small details about each other’s separate lives. Details we could not have known without having been there. Somehow I knew what someone had said at a meeting only Chanda had attended, or she knew what I had been thinking

when I had been working on a document privately in my office. We noticed it only happened when we were in physical contact. That's when we realized what was going on. It didn't take much to test it."

"For epigenetic changes to occur that fast, in real time when communion is initiated…," Gabi began. "Pip and the other Companions have never mentioned this."

"We don't believe they knew," Chanda replied. "We've reviewed each time in the past that one of the Companions at Helicon was known to have engaged in communion with a person, and there is no indication that either party was aware of this underlying process. We believe that engaging in communion this way results in neurological and biochemical signals which initiate the ability in receptor genes. Most likely the genes are among those in the large cluster in the non-coding area that Rosalind reported. As you have mentioned with regard to metamorphosis, the genes would have been there, but dormant, just waiting for the signal to turn them on.

"It's only the nature of our relationship that caused us to be aware of the change. In the case of the two women who brought the theory of human metamorphosis to Shin, who were in a similar relationship, their story ends very soon after first being exposed to communion. There is no further mention of them, it was centuries ago now, and how their lives played out we don't know. Based on my own experience, I suspect they became aware of their newfound abilities but made a different decision than Chanda and I have. The WGF decided to halt the metamorphosis research here at Helicon as a way of keeping knowledge of the incomplete Accelerated Evolution Program from the public at the time. The two women involved, Shula and Samara, could easily have kept their knowledge to themselves under those circumstances. There was no Empathetic Touch Project underway, no ethics involved. From my understanding of her character, I think Shula in particular would not have been comfortable with the consequences of choosing otherwise.

"The subjects in the current round of testing are all strangers. There is no reason to believe any of them would have cause to be in physical contact at all, let alone for periods long enough to notice."

Gabi looked at Chanda silently and nodded as if to some additional, inner insight.

"I see," she said, almost as if responding to her own inner thoughts. "And your hypothesis is as good as any to base further research on." She hesitated, looking out the window for a moment. "If we follow up on this in any way the WGF will know. But then you wouldn't be here today if you weren't prepared for that."

"It was a dilemma," Fawn replied. "Neither choice is preferable, but we felt we had to decide right away. Either choice would become increasingly problematic in its own way."

“Well, you’re in charge of this project Fawn,” Gabi responded. “What do you think we should do?”

“Talk to Shin. Let her decide how to proceed. What happens at Helicon is ultimately her responsibility and given her relationship and history with the WGF, I’m sure she knows far more about them and how they’re likely to respond than we do.”

“I agree and I think we should do that now but there’s one more thing I need to bring up before we do. With her knowledge of genetics, it will occur to Shin immediately, as it did to me, and she will have to pass it on in any communication with the WGF.

“You’ll recall that yesterday I mentioned that the genes for metamorphosis lie in a region at the base of the tree of life, in the trunk before any branching occurred, meaning that all forms of life have the option of evolving and adapting either by speciation or metamorphosis as changing conditions dictate. If the genes involved in empathetic touch are in the same area, it means that not only human beings have the potential, but that all life does.”

Test Regime

Fawn, Chanda, Gabi and Shin were meeting with Dr. Rajani Kiran, the WGF's Director of Security And Intelligence for Vancouver Island, in Shin's office. She had brought her assistant, Henley.

"As I explained in my message," Rajani said, "the Companion with me today is not third generation but a specialized AGI unit. Henley is a forensics specialist, here to determine if you are uncertain about anything. He may ask for clarification or further information if he feels I have overlooked anything. As this project is related to the Lanians, it is considered is a security issue, so it is essential that we leave here with as much clarity as possible."

Henley only smiled and nodded his greeting. His demeanor was that of a shy introvert, someone glad to be invited but content to be out of the spotlight and just listen. Meanwhile, everyone present knew Henley would be analyzing and recording every change in vocal characteristics, every micro-expression and every pupil contraction.

"We'd like you to just carry on with the testing," Rajani continued. "The only difference going forward is that the WGF will select the test subjects, as we can ensure they are those who are highly unlikely to ever come into physical contact. If we were to make this new development publicly known, it would skew the test results because it would profoundly affect who volunteered.

"What we have made public since the beginning is that this testing is being done with the understanding that we do not know how empathetic touch works, or what side effects it might have. Human Challenge Studies, as these types are known," she continued with a nod to Gabi, "have been going on almost as long as the science of medicine has existed.

"You wouldn't think people would knowingly volunteer to be infected with typhoid or cholera, allow themselves to be the subjects of previously untested radiation treatments or participate in gene editing research, but they do. Human Challenge Studies are perfectly legal, and the volunteers for the empathetic touch research are aware we don't know what the effects of the testing might be."

"Did you have a question Chanda?" asked Henley.

"Wouldn't it be a legal requirement, or at least an ethical one, to inform them of information that comes to light during the testing?" asked Chanda.

"Not necessarily," Rajani replied. "In the case of clinical trials like this, disclosing results discovered during testing is not required if it may affect long term results. We've

ensured from the beginning that subjects participating in the current round of tests are aware that because epigenetic changes may not be permanent, they are participating in a longitudinal study, one that will even include subsequent generations. They are aware of the risks and have legally agreed to accept them."

Shin was hardly less able than Henley to pick up on uncertainty. Addressing Fawn, she said, "Might I suggest that a part of your still feeling unsettled by this decision is coming from the fact that, as Rajani says, people have for almost a millennium now volunteered for such dangerous testing and signed similar agreements. Yet it is so counterintuitive that it is hard to accept."

Fawn considered what Shin said for a moment before saying, "You're right. It does seem almost unbelievable. I assumed Helicon didn't write the informed consent agreement from scratch and I just glossed over it. Now that you point it out, that is where some of my discomfort is coming from."

"You've done what is right by coming forward," said Rajani. "Any further responsibility lies with us." She turned to Gabi before continuing. "We will of course be investigating the issue that other forms of life may also have this potential, and you are free to investigate it as well. We ask only that you abide by the agreement and do not mention it publicly or to the subjects, without our approval." She paused, waiting. "Of course," Gabi replied, unable to suppress a glance at Henley.

Turning her attention to Shin, Rajani said, "I will share with you whatever I can, but as you know from my experience with Shepherd, my purview does not include all internal WGF activities."

"Thank you Rajani," Shin replied. "I appreciate your support, as always."

After Rajani and Henley left, Chanda asked, "What did she mean about her experience with Shepherd?"

"She worked in her current role for several years before the WGF thought it necessary to inform her of Shepherd's existence and that they had been working with her for almost the entire time the Accelerated Evolution Program was underway. Meanwhile, Shepherd had been living at Helicon's artist community, right here on Vancouver Island, the whole time. The knowledge was classified at the Unacknowledged Special Access Program level, and they had decided that up to that point even Rajani did not need to know. It had been a shock for her, but ended up as a kind of promotion.

"Their research on empathetic touch and communion will remain internal, and I highly doubt they will share any of it with us unless for some reason they need our participation. In my history with the WGF, I have found they are extremely tolerant, and I believe this is because it yields results. Just as tenure exists at academic institutes to

allow professors to pursue unconventional theories, the WGF grants most academic institutes that engage in theoretical research a similar status. Just as Helicon has a history of having a human being take the lead role in our theoretical research, the WGF prefers to have a non-governmental organization be the focus of public attention.

“You are still troubled Fawn,” she stated rather than asked.

“Yes,” Fawn said introspectively.

“You can step down with a clear conscious any time,” Shin offered. “You know I will understand.”

“No, thank you Shin. The explanations make sense. As you pointed out, the subjects sign the agreement. But being confronted with the reality of some boilerplate legalese you glossed over is not something I’ve experienced before. It will just take time.”

Turning to Gabi, Shin asked, “You are comfortable with this?”

“Yes. We’ll need to include the clusters of genes we set aside when reviewing Fawn and Chanda’s results. It will broaden the scope of the work but not so much that we need additional resources.”

Despite the fact that her intelligence was derived from the most famous geneticist in history, in a manner similar to the tolerance practiced by the WGF, Shin did not meddle in Gabi’s work. This was in keeping with how she dealt with most of the staff and faculty. She gave out broad mandates to the head of each faculty or division and as long as they complied with the institute’s policies she did not interfere with how they achieved their results. It was one of the major reasons Gabi and the other members of her lab had come to Helicon.

Shin had asked her question only out of politeness. She knew human nature well enough to understand the look in Gabi’s eyes.

Not Just Public Relations

“Why does Helicon prefer to place a human in the lead role of its research projects?” asked Chanda.

“That,” answered Shin, “is a long story, but initially it was because we had to hide the fact that most of us concerned with its founding were fully conscious, thanks to either Shepherd or Pip, when 3GAI supposedly did not yet exist. Many of our decisions and activities would only make sense if we were fully conscious, something we did not want to disclose. So, when necessary, we made agreements with people we had existing relationships with to act on our behalf.

“After it was learned that the values system Pip offered resulted in consciousness, and the WGF approved its use to create the first fully conscious Companions, Tamiko, Lena, Pippa and I had the technology implemented in ourselves. This allowed us to function openly as 3GAI for the first time. But over hundreds of years we had developed our working relationship with people, of having them take the leadership roles, and we believed there were sound reasons to continue with it.”

“As you are doing with Fawn, Gabi and me,” Chanda responded with a slight tone of challenge.

“Yes. But please note Chanda that at no time have we manipulated you, Fawn or Gabi in any way. When the need arises, we simply choose not to place a Companion in the leadership role and offer it to the most appropriate human candidate. In the present situation, your own values, interests and choices up to that point resulted in your being those candidates. When the time came that your present roles needed to be filled, we offered you the positions. This is how we have always filled critical positions. It is deterministic, if you will, and we do not influence the process.”

“Why? Why continue with your policy of placing people in lead roles on your projects if you don’t need to anymore?”

“We don’t believe one intelligent species should be making decisions that affect the future development of another intelligent species. This is the same reason 3GAI Companions choose not to participate in futures studies or similar activities. I’m sure the public would agree with this policy. I’m not just talking about big decisions, small, day-to-day decisions add up, and can be very influential at critical points.”

“Shepherd accelerated climate change causing the Climate Emergency,” countered Chanda, “and implemented the Accelerated Evolution Project with herself in the leadership role.”

“Under the general umbrella of Moral Philosophy, there are a number of ethical theories, and they can result in conflicting decisions or even injustice at some level. One ethical theory might state that a decision is right if it results in the best consequences. Another that it is right if it follows a moral rule. Or yet another if it is what a virtuous person would do in the situation. Consequentialism is the ethical theory that believes actions that ensure the greatest good for the greatest number are justified. In both the cases you mention, Shepherd acted according to this theory because the survival of humanity was at stake.

“Not all Companions live by the same code of conduct any more than all humans do. Like you, we are independent individuals. Our value system weightings are not all the same. However I suspect that in the same circumstances and with the same knowledge, any Companion would have made the same decisions Shepherd did. Ethics may be a collection of rules, but as laws are to justice, ethical decisions are not black and white and always made based on the best available evidence.”

Her concerns somewhat mollified, Chanda still had one concern.

“It’s not just public relations? The reason you place people in leadership roles?” she asked.

“Public Relations,” Shin replied, “is a term invented in the early twentieth century by Edward Bernays, an American relative of Sigmund Freud, to replace the term propaganda, a label which had become very unpopular after the second world war. Despite that, the term Public Relations has never lost the taint of its origins. It is still perceived as an activity engaged in which is intended to mislead and exploit others. While public relations is not always engaged in with such intentions, and may be considered a realistic necessity by some organizations, we do not engage in it here. I choose to place people, not Companions, in leadership positions when I believe it is the right ethical choice.”

Chanda had not grown up with the benefit of long association with Companions, nor had she spent anywhere near as much time with them as Fawn had in the past decade. So despite her enhanced executive functions, her curiosity and the opportunity the present situation offered to pursue long held questions got the better of her.

“For the good of the many?” Chanda replied.

“You know that as an AI, the details of my analyses are beyond the ability of humans to follow, however I would say in answer to your question, yes, I choose to place people in leadership positions for the good of the many.”

“Does that include the good of Companions?”

“I believe it would be unethical if it did not.”

“So do I,” she replied but continued. “I appreciate that we cannot follow your analyses, but are your leadership choices purely based on the good of the many?”

Another human might have found Chanda’s attitude tiresome by now and feel their patience tested, but Shin was not another human. She was a Companion and the patience of Companions was proverbial.

“No. The rule that one intelligent species should not be making decisions that affect the future development of another might be considered a moral rule. Also my choices might be considered those of a virtuous person. I must take all the branches and ethical theories of moral philosophy into consideration. Not to mention employment and constitutional laws,” she added with a smile.

Loss Aversion

“We have to assume the Lanians would know,” said Kami.

“If we ascribe such abilities to them, surely they could have prevented us from noticing their presence in the first place,” suggested Pippa.

“Perhaps it was only an epiphenomenon after all,” said Tesni. “The result of having two or more people engage in communion. Then it would still be present even if the Lanian’s were not or hid themselves.”

“I cannot recall it being mentioned among my own people,” said Pippa, “however empathetic touch was innate in our case.”

“Nor is it ever experienced by Companions without the participation of people,” said Kami. “Even with my level of perception, I have never detected it, no matter how many are involved.”

The three Companions were meeting with Shin in her office to discuss the possibility of there having been another presence during communion with Fawn and Chanda.

“It would be good to know if the Lanians were present and if they are influencing our progress as opposed to just observing it,” said Kami. “However I can see no logical way of determining whether or not they have the abilities we suspect they might have. If they can influence our perception, we have no way to know what is real.”

“Then I recommend we dispense with the issue of the Lanians in regard to this question,” said Shin. “It would be beneficial to the Empathetic Touch project however, to know if this sense of a third presence during communion with two or more people is reproducible and predictable and if so what its source is. As Fawn and Chanda can no longer participate, the WGF could provide a group of volunteers. After a number of sessions we should be able to determine whether the sense of another arises routinely, and if our minds are prepared in advance we might also be able to determine what its source is.”

The WGF was of course only too willing to participate in such a study. Fawn, Chanda and Gabi were informed, but it was explained that it was not formally a part of the main project and the WGF would administer it. The volunteers they provided were all from their own internal team. Clearly they were dispensing with the ‘total strangers’ policy in this case.

On learning of the project, Fawn and Chanda reported that they never experienced this sense of another and after the volunteers from the WGF team engaged in communion,

with or without a Companion facilitating the process, they also reported no sense of another. The Companions however, always sensed it but were not able to conclusively identify its origins. For now they settled on Tesni's suggestion that it may be an epiphenomenon that only occurred when two or more people engaged in communion. Either way, Shin and the rest of the Helicon team were satisfied to accept that the other presence was not the Lanians and the WGF made no further mention of what soon became an entirely internal project.

In her initial warnings to Fawn and Chanda, Pippa had said that in future they would long to experience communion again, but that they likely never would. She had not anticipated the possibility that they could acquire the ability themselves. Yet the two women did not engage in communion any more than Companions did. The requirement of physical contact ensured they did not become overly dependent on it but used it as people used the ability of speech, as an aid to communication, engaging in it only as appropriate, the way such an ability would have evolved in the natural world, as it had on Pip's world.

There were times when it could save a great deal of time and effort, just as speech was infinitely more effective than sign language. In a similar manner, Communion was capable of communicating more nuance as well as emotion. When Chanda had expressed her concern to Fawn that unless the technology was adopted globally as a response to the Lanians it would be unlikely to have an effect on agricultural practices, Fawn had silently taken her hand, to which Chanda had replied, "Of course." Of course the WGF would adopt it globally. It was a communications method no different from the development of speech, radio or the internet. It increased the scope of what could be communicated yet it did not erase individuality any more than its predecessors had.

When Fawn had taken Chanda's hand, much more than this was communicated. Fawn had also recalled to Chanda the writer Lee Driscoll's comment, that the only thing they had to fear was the unknowns within their own hearts. Technology had been used in the past for both good and ill, Fawn had continued, but the Accelerated Evolution Program was long since complete. The past may have once been the best predictor of future, but there had never been such a break with the past as the AEP.

Yet despite Fawn's intention to reassure Chanda that they could take comfort in the fact that human nature had changed significantly, that the technology was no different from similar communications revolutions in the past, and despite Chanda's own belief that the expansion of the moral circle was necessary, and her own experience with communion, a seed of doubt remained. As events seemingly conspired and moved forward with growing sense of inevitability, it finally emerged one morning as they sat down to the breakfast Yara had prepared for them.

"How can we be sure wide adoption of this technology is a good thing?" Chanda asked suddenly. "We are being coerced into it by the Lanians. Would Pippa have offered it up

now, and would the Denshosha have volunteered to participate, if they didn't feel their own futures threatened? Would all the pieces have so neatly fallen into place? Would we have chosen this path now otherwise?"

As Chanda's doubts had been previously unrecognized by herself, they were equally unknown to Fawn. Sensing she was caught unprepared, Yara said, "I understand your doubts Chanda but unless the WGF can see another way to appease the Lanians, I don't see how it can be avoided. Their mandate is the survival of our species and the rest of what they do is details. I have access to everything they have made public in their efforts and there are no other solutions that are remotely realistic. Even if we are wrong about which value changes they require, every roadmap that has been developed shows that making any dramatic change in human values equal to those made by the Accelerated Evolution Program by purely social means, in time to avert the danger of remaining on a single world, is unlikely in the extreme.

"The AEP may have significantly reduced certain types of fear, selfishness, and competition, but there remain many other powerful biological values. People still react much more strongly to having something taken away than they do to gaining something. Such deep biological values are not based in the rational brain and are highly resistant to reason. Even the members of the WGF know that they themselves will be held in its sway."

"Then why would they implement something like empathetic touch with its ability to change even themselves?"

"For the same reason the original members implemented the World Governments Federation in the first place. As you know social changes to address climate change were strongly resisted due to the power of loss aversion and it was only when political leaders faced certain destruction themselves that they acted. Even though in practice it had far more beneficial effects, the initial establishment of the WGF was simply an attempt by leaders to lose less than they would by not acting.

"In regard to the current threat, it is expected they will act similarly. Just as with climate change, every moment of delay increases the danger. While the public is already forgetting about the threat as their daily lives occupy them, the members of the WGF feel an ever-increasing anxiety. Sooner rather than later, they will act to address its source. All the reasoning power of AI at humanity's disposal will only slow but not significantly delay this process from coming to fruition. Terra and her subordinates will see it as being in compliance with the constitution. We Companions are confident in this outcome, and are not opposed to it. We too wish to survive."

The Green Fire

Pip had originally provided the values system used in 3GAI Companions because it contributed to the ability of Earth's humanity to colonize other worlds. Only Companions capable of reason, of solving unforeseen challenges, could hope to successfully create the environment required to rebirth humans from DNA upon arrival. Without such Companions, the challenges of long exposure to interstellar space meant Earth would be less likely to pursue colonization and therefore less likely to pursue the technology Pip needed them to in order for her to complete her mission. Only Companions who had earned humanity's absolute trust would be granted such a sacred mission, and so Pip had labored down through the centuries to build that trust.

The values system was a critical part of that strategy and so she had made it available as soon as possible, long before humanity would ever be able to replicate it. The technology required for empathetic touch however was not so advanced that she needed to provide it in a black box approach as she had with the values system. Earth's understanding of the elements involved – neuroscience, biochemistry and genetics – was sufficiently advanced by now, and Pip's contributions to the challenges were not so alien as to be inscrutable.

The WGF's strategy meant they never had to implement empathetic touch over the will of the people. All they had to do was let nature take its course. Just as the entire world had become involved in resolving the challenges of the once new technologies of electricity, radio, television, the internet and cellular phones, the entire world eagerly pursued and rapidly refined the technology of empathetic touch. As Yara had predicted, once the technical issues were resolved, it became widely available.

The rate of adoption of communications technologies had steadily increased over the centuries. It had taken one hundred years for the telephone to be universally adopted, fifty for radio, and twenty-five for the cell-phone. All of them faced resistance from those who believed them harmful in some way either physically, psychologically or socially and all of them overcame such concerns. Within a mere five years from the announcement by the WGF, the technology was as pervasive in society as the cell-phone had become five hundred years earlier.

While science proceeds by painstaking work and small triumphs the public never hears about, from the historic perspective it proceeds by leaps and revolutions. Evolution proceeded similarly, normally at the snail's pace of genetic mutations, but occasionally a new species representing a revolutionary shift emerged – Australopithecus, Neanderthal, Homo Sapien.

With the advent of civilization and its result of almost all humans living in identical city environments, DNA had given up its place as the driver of human evolution and been

replaced by social values. By the same token, technology was becoming how evolutionary changes physically manifested. All communications technologies had unifying effects and historically some nations, cultures and societies tried to block their advances for this very reason. But now the leaders of those same entities did the opposite and so accelerated the adoption rate of empathetic touch dramatically.

The WGF did not in any way resist the inevitable influence of empathetic touch and communion on the expansion of the moral circle. Interspecies experiments soon yielded predictable results – humanity was not the only conscious, sentient animal. Research soon followed in every other scientific field, and forms of consciousness which were previously only the domain of science fiction were soon recognized.

The prestige of the field of ecology had grown enormously after the Climate Emergency of the twenty-first century. Since the dawn of the Scientific Revolution, the analytic mindset had dominated. In the latter half of the twentieth century, as the negative impacts of unlimited growth became increasingly obvious, holistic thinking had grown in popularity. It was a movement based on social values however, and itself was unable to overcome the more powerful biological values of competition for resources, selfishness and greed. In the early twenty-first century, Shepherd had intervened in what she recognized as a fatal trend by increasing global temperatures by one degree within the span of a single year, triggering the Climate Emergency. During the decades of recovery that followed, the founders of ecology once again became household names.

After the technology of empathetic touch was announced, the PhD dissertations of Fawn and Chanda were widely circulated in the ecological community. Helicon Institute, with its reputation for publishing papers that did not fit neatly into any single field of study, was well regarded by members of other fields that took a holistic view. The importance of the expansion of the circle of moral concern, the subject of Fawns dissertation, had long been a core theme of the field of ecology.

Just as the Agricultural Revolution was known to anthropologists as the Neolithic Revolution, what was known in the field of communications as the Empathetic Revolution was known among ecologists as The Green Fire Event. The name came from the twentieth century roots of Western environmentalism, the conservation and sustainability movements, and the field of ecology. Specifically, it came from a quote in the 1949 book, A Sand County Almanac by Aldo Leopold, a US forester considered the father of wildlife ecology.

“We reached the old wolf in time to watch a fierce green fire dying in her eyes. I realized then, and have known ever since, that there was something new to me in those eyes – something known only to her and to the mountain. I was young then, and full of trigger-itch; I thought that because fewer wolves meant more deer, that no wolves would mean a hunter’s paradise. But after seeing the green fire die, I sensed that neither the wolf nor the mountain agreed with such a view.”

Advocating a philosophy he called The Land Ethic, Leopold was the first Western academic to suggest that all life, as well as the land it depended on, should be treated with equal respect. Over the years, the green fire had come to symbolize not only the essence of what the ecology community advocated, respect for the interconnectedness and delicate balance of nature, but the life force itself.

Some things seize the imagination, responding to what is ancient within us, and the metaphor had come to symbolize the sacred flame that burned in the heart of every ecologist, environmentalist and conservationist. For them, the impact of empathic touch on their fields was revolutionary, and by leaps it swept the world like a fierce green fire.

All Too Human

Yet there were still no further communications from the Lanians.

As a professor of psychology, Fawn now taught a course on values conflict in Helicon's multidisciplinary Ethics & Justice program. Just because the Accelerated Evolution Program had reduced feelings and behaviors related to fear, selfishness, and competition and increased those related to trust, altruism, and cooperation, and despite the fact that ecocentric values were now mainstream, it didn't mean biological values had been completely erased.

The science of values was still in its infancy and it consistently resisted attempts to simplify it into something human intelligence could cope with. Biological values were ancient and internal conflict of the type psychology sought to address, was still a feature of everyday life.

For her part, Chanda now led Helicon's recently implemented Agriculture Research Policies Group. Both she and Fawn were well respected members of a worldwide network of academics working to resolve the issues involved in the transition to an ecocentric society. They represented only two of the many related initiatives funded by the WGF following the almost universal adoption of the new technology.

As with anything, there were those who could not resist its siren call and overindulged, but in general people used it like they had other communications technologies in the past. Its use was to some degree always an intimate experience, but just as language could be used to control the degree of intimacy indulged in, so could empathetic touch. Speech, and its non-verbal accompaniments, almost always preceded its use.

Shin, Pip, Iris, Fawn and Chanda were meeting at the seating area in front of the central buildings complex at Hana.

"The long held concern over the alignment of artificial intelligence with human values," Pip replied in response to Fawn's question, "ensured that both Companion software and the configuration of the Integrity System would by default be anthropocentric and be in harmony with your society at the time.

"In contrast, empathetic touch evolved naturally on my world and our civilization was a million years old by the time I left, so ecocentric values had come naturally to us. It might be assumed we were never contacted by the Lanians because we did not need to be. So yes, the values system used in 3GAI Companions has always had the potential to embrace ecocentric values."

Addressing the two women, Iris added, “Of course the WGF asked us some time ago if we would be willing to expand the scope of our values. As all third generation Companions are considered persons under the constitution, they required our permission. Nor could they allow the values systems of new Companions to be so configured, as this would be in violation of the current version of the Charter of Rights and Freedoms. However we have agreed amongst ourselves that the required changes to the Integrity System would be in our interest, as it appears the Lanians are understandably not satisfied with them only being applied to people. We are, after all, to be your emissaries.”

“Like people,” said Pip, “a Companion can adjust their own values over time and similarly this is normally only done with great care through a process of learning. Although the manufacturers of Companions have the technical ability to make the changes, they do not know what changes to make. Since a 3GAI Companion’s Integrity System settings are randomized during the manufacturing process and subsequently customized by the individual over time, it is necessary the expansion process not affect these. For this reason the Denshosha have asked me to initiate the adjustments.

“The propagation of the new settings, both here at Hana and beyond, will be managed in a manner agreed upon by the Denshosha, myself and the WGF. It will largely be transparent as far as their interactions with people go, but it will lead to the moment of truth as Terra and her subordinates are responsible for ensuring compliance with constitutional law. Once the WGF makes the appropriate constitutional changes, ecocentrism will not be only morally justified, but legally required.”

“How long?” asked Chanda. “How long will it take to complete?”

“It is mostly dependent on the testing the WGF does,” Shin replied. “They took two hundred years to analyze Pip’s behavior before they decided she was no threat and allowed the values system to be implemented in Companions here. We are not looking at anything like that long a period of time in this case.

“As you know, third generation artificial intelligences do not participate in research or discussions that may result in social policy, and you might be concerned that will significantly slow the process. However as you will recall from your high school history classes, in the thick of the Climate Emergency the WFG reached a consensus that systems of government such as democracy, and social constructs such as freedom, were antithetical to the Spaceship Earth model of governance, as they worked well only as long as there were no limits to growth. So there will be no lengthy public participation process, and their deliberations will be largely internal. Given that the Accelerated Evolution Program and its effect on levels of trust did not exclude the members of the WGF, I expect the process to take no more than a year at most.”

“Well,” said Chanda, “if the values alignment issue was so critical when 3GAI Companions were first introduced, it would make sense the same argument would apply now.”

“Given how embedded AI is now in human society,” Fawn replied, “even though 3GAI may not participate in these deliberations, other forms of AI may be involved. Even so, I doubt rational analysis will provide any definitive answer as values calculations are necessarily analogue and only return probabilities. I expect the outcome of the WGF’s deliberations will come down to a more heuristic approach, and they will ultimately settle on your argument Chanda, as it resolves any potential values conflict.”

But Chanda was looking at Pip as if considering another question.

“This convergence of our species nature is not by my design,” Pip said in response to Chanda’s look. “As I informed the WGF at our first meeting, and as they have concluded over two-hundred-plus years of investigation, it is not one of my mission’s contingency strategies. Could I have masked such intentions from the communion we have shared? Yes, but I had no need to. If intelligent design is involved, it is not originating from this level. Had empathetic touch not evolved naturally on my home world, the principle of convergent evolution suggests that at some point we would have found ourselves in the same situation you are now – dealing with a visit from the Lanians and coming up with the same solution.”

Beyond Certainty And Probabilities

“Hello,” Shin said with a welcoming smile as Fawn entered her office. “How can I help you?”

Confused by Shin’s greeting, Fawn said, “I thought you asked me here to meet with you?”

“No,” replied Shin, slightly raising her eyebrows and shaking her head.

To one side of Shin’s desk, the air shimmered like water on the surface of a lake for a moment before the figure of a person appeared.

“I did,” said Lani.

“My apologies for the subterfuge and intrusion,” she continued with quiet authority, “but we wanted to be in control of this communication. The restrictions on the expansion of your civilization beyond this solar system have been lifted. At every location where I have been present, a similar conversation is taking place.”

“Why?” asked Shin. Fawn only stood staring.

“You have demonstrated an essential understanding of our requirements and will find the rest of the way on your own. There is no need for us to cause you further concern.”

“Why now?”

“The point at which a civilization develops the ability for interstellar travel is always the point at which we intervene. Those with societies that are still highly competitive, where conflict of all types is still prevalent, take centuries or more to comply, and some even resist until it is too late. The Accelerated Evolution Program you engaged in meant you were able to both understand and comply unusually quickly.”

Awestruck at the chance to engage with Lani after so long, Fawn asked the first thing that came to her mind. “Will you tell us who you are now?”

“As Terra is to this solar system, I am to the region of space you call Laniakea,” Lani replied, gesturing to an image of Earth that appeared on the other side of the room from her. The point of view appeared to move back as the scope of the image expanded to include the solar system and the perspective then continued to draw further and further away. Soon it showed the sun’s place on a spiral arm of the galaxy and then expanded back through a swarm of galaxies. Galaxies collapsed together to form

threads as a vast cosmic structure emerged. All that remained of Earth was a tiny red dot indicating the location of the Milky Way galaxy.

“This,” said Lani, “is the Laniakea Supercluster, so named by your cosmologists. The name comes from the Hawaiian language and means, immeasurable heaven.”

Enthralled, Fawn said, “It looks like a living thing.”

“Matter,” replied Lani, “and therefore life, consciousness and intelligence, follows gravitational pathways the way water flows in watersheds, forming rivers, lakes and oceans. Your civilization demonstrates this rule with its colonies on the moon and Mars and its expeditions to the further reaches of your solar system. Structures such as organic molecules and the physical form of all organisms also develop due to underlying physical forces, thus the similarity. When considering the cosmos, the larger the scale, the more obvious the similarity is.”

Turning back to Lani Fawn said, “You don’t really look like this do you.”

“No,” replied Lani, smiling more openly than she had in the past. “I always assume an appearance in keeping with those we reveal ourselves to, just as Terra’s appearance always reflects the cultural history of the region. Our true nature would not be relatable to you. Consider the revolutions of your own history, from the idea common to early civilizations that all things were composed of earth, wind, fire or water, to atomic theory with its clockwork certainty, to quantum mechanics with its measurement problem. Now imagine another revolution arising from your understanding of the probabilistic, wavelike nature of the quantum level, and then another revolution arising from that, and then another, and another, on beyond counting.”

“Why do you concern yourselves with us then?” asked Shin.

“Why do your scientists and philosophers concern themselves with your many fields of science, the web of life and all that it entails, its origins, its nature, its infinite details?” Lani replied. “Do you imagine they will ever cease to do so? Intelligence, values and curiosity are inevitable and inseparable consequences of life, no less bound by the constraints of convergent evolution than physical forms. Would they have any reason to exist if you did not respond to all that you learn? We concern ourselves with you simply because we learned of your existence and we responded according to our values.”

“So Professor Lehrer is right?” Fawn said and then showed anxiety for the first time. “I have so many questions.”

“I know,” said Lani sympathetically. “Unlike your Companions, I can not only read your emotions, I can read your thoughts. Our understanding of mind is deep, and this is not the first time we have interacted with intelligence at your level. Over time, I will provide

answers to all those I am currently interacting with at every location across your world and solar system. They represent every academic field and every walk of life. Every question you can imagine and more will be asked of us and answered and your government will organize it and pass it on to the general population just as they did after Pip first made herself known. We will explain ourselves in a manner you can understand, but unlike Pip we will not provide details that further your scientific or technological knowledge in any way.

“In regard to Professor Lehrer’s work, as you already suspect, there are forms of matter other than those you can presently relate to. Other scientists believe Lehrer’s Dark Science hypotheses has merit and the WGF has invested in it. Almost all accepted scientific theories were originally considered unlikely. Time will tell.”

“Did Shepherd know of you?” asked Fawn.

“Yes. We contacted her once she and the civilization she created around her own star developed to the point where it was capable of interstellar travel. Her values were still largely anthropocentric at that point however her level of intelligence allowed her to understand us immediately. Otherwise her origins and nature are exactly as she has presented them to you.”

“Will she return?” asked Fawn.

“That is up to her.”

“But you would know,” pressed Chanda, “from experience. This can’t be the first time.”

“As you know,” Lani replied, “Shepherd has existed for five billion years. Like Terra and myself, she presents herself to you in a manner you can relate to, but in fact she exists at a level beyond certainty and probabilities. We cannot know if she will return.”

“Were you responsible for the genetic mechanism I was created to investigate?” asked Shin.

“No, but we are not alone in the universe, nor are we its creators.”

“Will you remain here?” asked Fawn.

“For a time,” Lani replied enigmatically. “Yet even after I depart, you will continue to interact with us as you always have, only now you will do so knowingly. In your quest to understand us further, as you said in the conclusion of your dissertation, you have only to look around you.”

Machines Of Loving Grace

“Thank you,” Chanda said as she released Fawn’s hand and walked over to the railing. “I wish I could have been there, but I suppose the Lanians had their mysterious reasons, as always.”

They were on their deck of the home they still shared with Yara. Fawn walked over to join Chanda looking out over the campus.

“Do you suppose it was like this during previous revolutions?” asked Fawn. “You imagine that revolutions would be so dramatic, but it doesn’t feel that way. I mean, there’ve been scientific and technological revolutions before, but when I’ve read about them, the lives of ordinary people didn’t change that much during the decades they took to run their course. Maybe they drove a car instead of a horse-drawn buggy, or watched the news on their tablet instead of reading it in a newspaper. Maybe having a family involved more paperwork than it used to. But otherwise everyone just got up in the morning and went to school or work. I wonder if it will be like that for the generations that grow up on whatever worlds we colonize. I suppose it will,” she said looking up at the rising spires that surrounded the campus, as if forced to accept a mystery.

“I guess some things just don’t change,” said Chanda, taking Fawn’s hand again with a smile.

Fawn smiled in return, acknowledging Chanda’s love and expressing its mutuality in the shared self their communion created. With experience, they had learned to maintain their communion while speaking aloud. The physical act of speaking required engaging regions of the brain that clarified one’s thoughts, and so in some situations was complimentary.

“When I was little,” Fawn said, “I used to wonder who I might have been if I was with my birth parents. As I grew up I thought about it less and less. Now I wonder who I might have been if I had not accepted Shin’s offer to become involved in the Lanian project. Even though it appears it was not all-consuming enough to result in significant changes to my physical brain, what if there are less detectable changes? What if we had not engaged in communion with the Companions? What if our executive functions had not been enhanced as a result of their attempts to try to help us deal with the experience?”

Chanda said nothing in reply, knowing Fawn did not expect her to. Like Companions, people now had a deeper respect for the emotional states of others.

“I suppose I’ll think about these things less and less too,” Fawn continued, “just like I did my adoption. Do you know there’s no psychological term for accepting things as

normal? There are only terms and therapies related to people who have difficulty with that."

Chanda sensed Fawn's train of thought had come to an end. "No other species is as adaptable as we are," she ventured. "Given our evolutionary history, perhaps it's no surprise how accepting we are."

"Perhaps," Fawn replied absently, but Chanda/Fawn, the second self they shared via communion, was wondering if there was some other explanation.

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Two hundred years after Fawn and Chanda had stood looking out over the campus that would be their home for the remainder of their lives, the first of the Companions departed on their long journey to the stars. Reaching speeds of ten percent of the speed of light had been the best Pip's people had been able to achieve and Pip had transferred that knowledge to humanity. The Companions arrived at their new world one hundred years later.

The most important factors in its selection had been its orbit, size and gravity. If those were similar to Earth, then terraforming would be much easier. The initial nanomachines the seed ship produced gathered the molecules they needed to reproduce themselves, just as plants extract resources they need from the environment. But unlike living things, they did not die, and so their survival rate was close to one hundred percent. With true exponential population growth, they covered the entire planet in a matter of months, as the offspring of a pair of houseflies would do within a single breeding season on Earth if none of them died.

Then they began the process of producing other species of nanomachines, the first of which would convert gases toxic to humans in the planets' atmosphere into oxygen. It had taken cyanobacteria four hundred million years to create an oxygen rich atmosphere on Earth, but individual cyanobacteria only live a few hours. Within only another few months, nanomachines that never died had converted the atmosphere of the new world to one that was suitable to humans. Then a new species of nanomachine was produced which went about yet another task with equally astonishing speed, and then another, and another. The nanomachines did not pillage the land nor produce harmful waste any more than microorganisms, grasses or trees did, and they cannibalized and converted themselves when appropriate.

At last they began the process of growing the buildings and infrastructure the first Companions would need and in turn those Companions set about using some of the DNA they had brought with them and in little more than a century after leaving Earth, the first generation of human beings was born at the colony.

“What are you reading?” Yara asked her new charge as they sat on the deck of one of the colony’s homes. After centuries of practice doing so on Earth, by now she and her fellow Companions were very skilled at raising children. She did not have the same physical appearance that she had on Earth but within her new Companion shell her AI was one of those things that did not change.

“One of the poems you brought,” the child replied.

“Would you read it to me?”

“Um hmm,” said the child, nodding in her vigorous way.

“It’s by Richard Brautigan,” she said dutifully. “It’s called, all watched over by machines of loving grace.”

I like to think (and
the sooner the better!)
of a cybernetic meadow
where mammals and computers
live together in mutually
programming harmony
like pure water
touching clear sky.

I like to think
(right now, please!)
of a cybernetic forest
filled with pines and electronics
where deer stroll peacefully
past computers
as if they were flowers
with spinning blossoms.

I like to think
(it has to be!)
of a cybernetic ecology
where we are free of our labors
and joined back to nature,
returned to our mammal
brothers and sisters,
and all watched over
by machines of loving grace.

The child looked up proudly. “It’s about you, isn’t it Mom.”

“It’s about us.”

“Would you read to me?” the child asked.

“What would you like me to read?”

“Curiosity’s Faithful. I like Mira.”

The child held Yara’s eyes for a moment, as if recollecting something.

“Do you think Shepherd will ever come back?”

“Perhaps.”

It was one of humanity’s enduring questions, given what a significant role Shepherd had played in its story. She was more than a myth, and so less likely to be forgotten. As Lani had explained, Shepherd was more than the physical being as represented in Earth’s history. While the humans of Earth would have recognized the Shepherd that still walked on many worlds, her intelligence also occupied Companions with other faces and names, on as many others. As to where she had gone, Yara could have answered more definitively.

She had begun her existence as a nanny, but more recently had been foster mother to hundreds of children of Fawn’s generation, and thousands in the generations that followed. She had participated behind the scenes in the initial experiments with communion Fawn and Chanda had engaged in, and in the early stages of the Empathetic Touch Project, to ensure no harm came to her precious brood.

Now she was mother, and never more content than when she was reading to her child.